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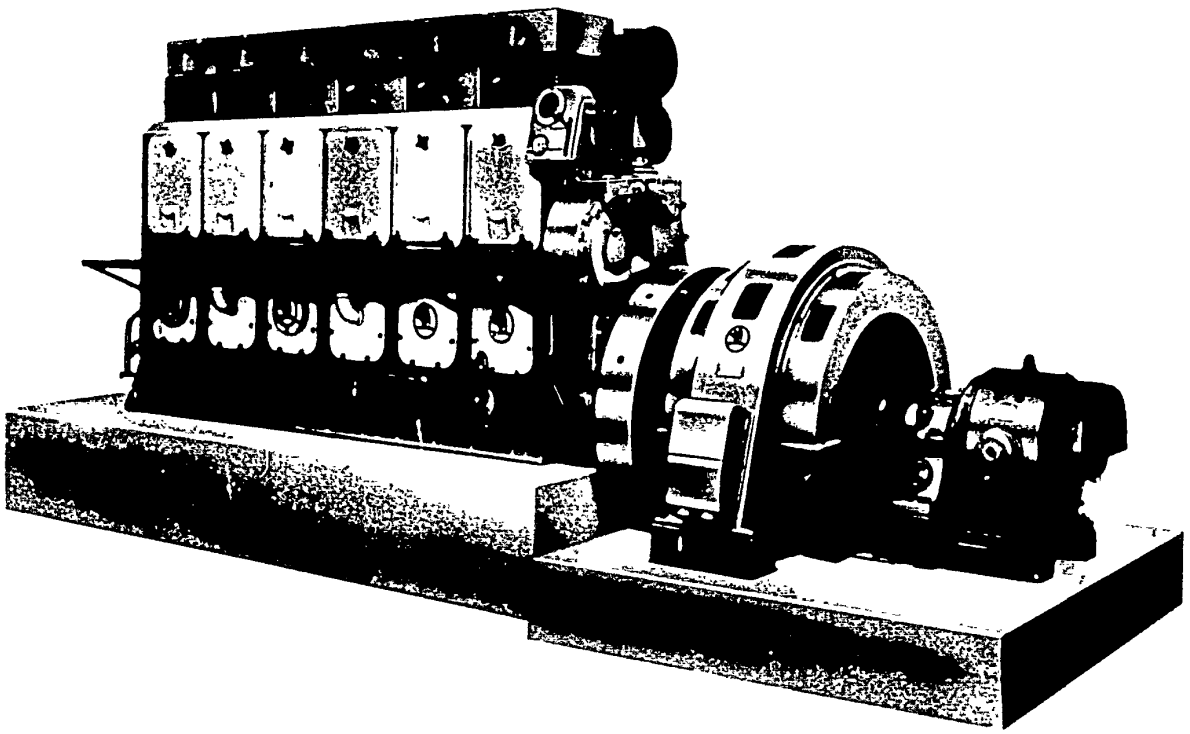
Slavia



DIESEL

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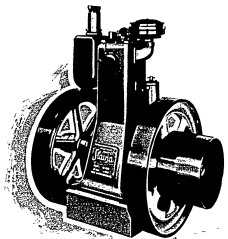
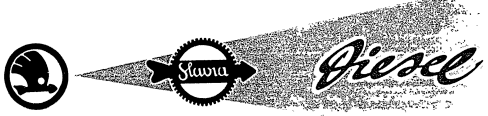
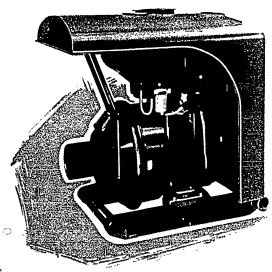
Mehr als fünfzigjährige Erfahrung und ununterbrochener lebendiger Kontakt mit den Anforderungen des Weltmarktes bestimmten die Richtung der Entwicklung und Erzeugung der tschechoslowakischen Dieselmotoren der Marken ŠKODA und SLAVIA. Erstklassige Werkstättenarbeit, Betriebssicherheit unter schwierigsten Klima- und Arbeitsbedingungen, leichte Bedienung, dauernde hohe Leistung bei kleinstem Verbrauch von Treib- und Schmierstoffen verschaffen diesen Motoren allgemeine Anerkennung. Ein Beweis für diese Beliebtheit bei einem weiten Kreis von Besitzern in mehr als 60 Ländern ist die derzeitige Einreihung an vierter Stelle in der Reihe der größten Exporteure und Produzenten der Welt.



FLUGBLATT BRUSSEL 1958.
DS-15 — Die Motoren sind für landwirtschaftliche Zwecke zum Antrieb von Pumpen, Baumaschinen, Dreschmaschinen, Schrotmaschinen usw. bestimmt.

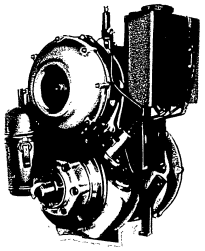
Leistung			
	DS	5 PS	bei 900 U/mir
	D8	8 PS	bei 800 U/min.
	D12	12 PS	bei 700 U/min.
	D15	15 PS	bei 650 U/min.



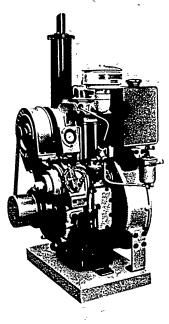


1 S 100 K — Stehender Viertakter, geeignet zum Antrieb landwirtschaftlicher Maschinen und Pumpaggregate, für Lokomotiven u. dgl
Leistung 9 PS bei 1500 U/min.
Ausführung ebenfalls in Schiffstyp 1 L 100 K, ferner in Zweizylinderausführung 2 S 100 K

ŠKODA



1 D 110 — Dieselmotor von 16 PS Leistung bei 1800 U/min, zum Antrieb von Generatoren, Kompressoren, Pumpen, Baumaschinen, kleineren Schiffen, Drahtseilbahnen, landwirtschaftlichen Maschinen u. dgl. geeignet.

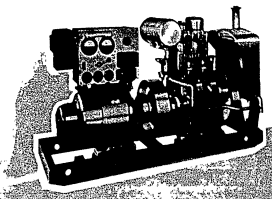


1 ST 120, 2 ST 120 — Dieselmotoren folgender Le

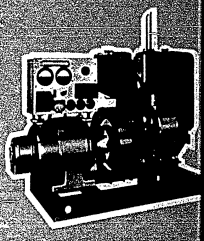
1 ST 120	max 17,5 PS	180(
2 ST 120	35 PS	180(

Lieferung in Ein- oder Zweizylinderausführung
trieb von Generatoren, Kompressoren, Pumpen, F
nen, Schiffen sowie für andere Zwecke geeignet

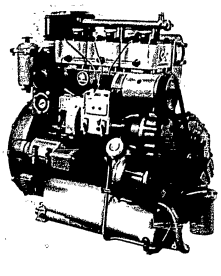
1 D 80 — Luftgekühlter Dieselmotor von 6,5 PS Leistung bei 2200 U/min, zum Antrieb von landwirtschaftlichen Maschinen, Traktoren, Pumpen, Generatoren usw



DR 27 — Der Motor dient zum Antrieb von verschiedenen maschinellen Einrichtungen, wie z.B. Pumpen, elektrischen Generatoren usw. Leistung des Motors 27 PS bei 1500 U/min. Leistung des elektrischen Aggregates 15-20 kVA.



1 S 110 — Dieselmotor mit Leistungen von 10-15 PS bei 1000 bis 1500 U/min, geeignet zum Antrieb verschiedener maschineller Einrichtungen, sowie Generatoren von 5-10 kVA. Leistung, Ausführung auch in Schiffstypen



2 D 110, 4 D 110 — Wassergekühlte Die
Vierzylinder-Dieselmotor, zum Antrieb von
ren, Pumpen, Baggern, Traktoren, Schiffen
geeignet.

Leistung			
3 D 110	65 PS	1800
4 D 110	85 PS	1800

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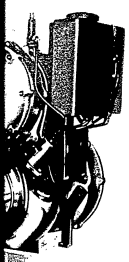
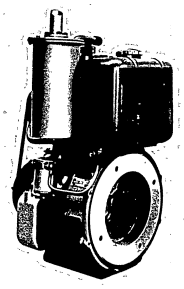
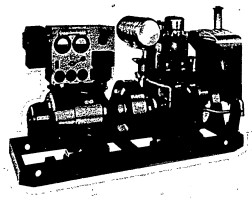


motor von 16 PS Leistung bei 1800
von Generatoren, Kompressoren, Pum-
kleineren Schiffen, Drahtseilbahnen,
Maschinen u. dgl. geeignet.

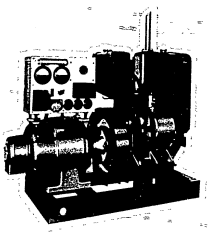
1 D 80 — Luftgekühlter Dieselmotor von 6,5 PS Leistung bei 2200 U/min, zum Antrieb von landwirtschaftlichen Maschinen, Traktoren, Pumpen, Generatoren usw.



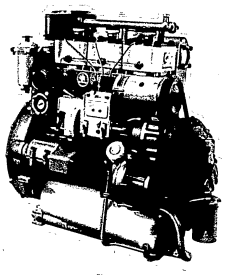
1 ST 120, 2 ST 120 — Dieselmotoren folgender Leistungen
1 ST 120 max. 17,5 PS 1800 U/min.
2 ST 120 35 PS 1800 U/min.
Lieferung in Ein- oder Zweizylinderausführung; zum Antrieb von Generatoren, Kompressoren, Pumpen, Baumaschinen, Schiffen sowie für andere Zwecke geeignet.



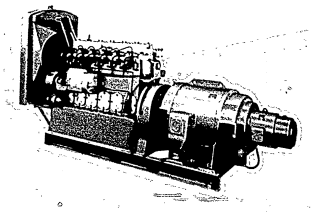
DR 27 — Der Motor dient zum Antrieb von verschiedenen maschinellen Einrichtungen wie z.B. Pumpen, elektrischen Generatoren usw. Leistung des Motors 27 PS bei 1500 U/min. Leistung des elektrischen Aggregates 15-20 kVA.



1 S 110 — Dieselmotor mit Leistungen von 10-15 PS bei 1000 bis 1500 U/min, geeignet zum Antrieb verschiedener maschineller Einrichtungen sowie Generatoren von 10 kVA Leistung. Ausführung auch in Schiffstypen.

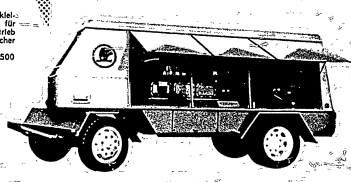


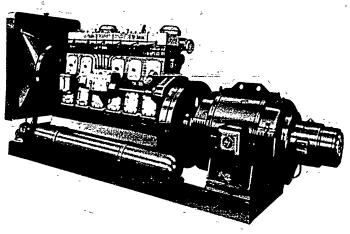
3 D 110, 4 D 110 — Wassergekühlter Drei- oder Vierzylinder-Dieselmotor zum Antrieb von Generatoren, Pumpen, Baggern, Traktoren, Schiffen u. dgl. geeignet.
Leistung 3 D 110 65 PS 1800 U/min.
4 D 110 85 PS 1800 U/min.



2-4 S 110 — Dieselmotoren von 20-90 PS Leistungen bei 1000 bis 1500 U/min, geeignet zum Antrieb verschiedener maschineller Einrichtungen wie z.B. Kompressoren, Pumpen, kleinerer Lokomotiven sowie elektrischer Alternatoren von 16-75 kVA Leistungen.
Diese Motoren werden ebenfalls in Schiffsausführung einschließlich Wendegetriebe, Wellenleitung und Propeller geliefert.

4-8 S 140 R — Mit Rücksicht auf das kleine Gewicht sind diese Dieselmotoren für fahrbare Aggregate wie z.B. zum Antrieb fahrbarer Kompressoren und elektrischer Aggregate geeignet.
Leistung 80-224 PS bei 1000 bis 1500 U/min.





4-8 S 160 — Dieselmotoren mit Leistungen von 90 bis 180 PS bei 750 U/min, geeignet zum Antrieb verschiedener maschineller Einrichtungen wie z.B. Pumpen, Bagger, Bohrgarnituren, elektrischer Alternatoren 60-150 kVA Leistungen. Leistung 90-180 PS bei 750 U/min. Diese Motoren werden auch in Schiffsausführung 4-L 160 mit Leistungen von 90-135 PS geliefert. Bei Aufladung mit Turbogebläse erhöht sich die Leistung um 44 %.

Slavia

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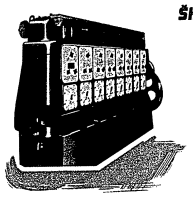
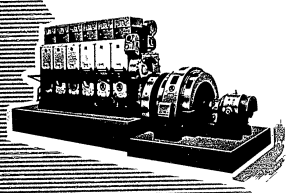
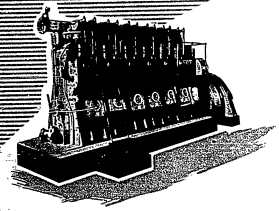


4-8 S 220 — Dieselmotoren von 160-320 PS Leistung bei 600 U/min, verlässlicher Konstruktion; geeignet zum Antrieb von Alternatoren mit Leistung von 125-250 kVA und sonstigen maschinellen Einrichtungen, Pumpen usw.

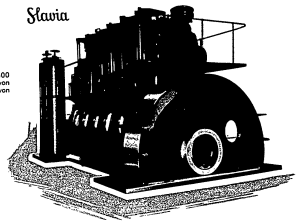


4-8 S 275 — Dieselmotoren von 260-520 PS Leistungen bei 500 U/min sind zum Antrieb elektrischer Generatoren von 200-450 kVA Leistung geeignet.
Die Sechszylindermotoren werden als Schiffsmotoren mit Leistung von 390 PS bei 500 U/min oder, mit Turbogebläsen tschechoslowakischer Produktion versehen, mit Leistungserhöhung von 40 % hergestellt

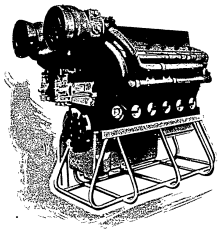


4-8 S 350 — Diese Dieselmotoren sind zum Antrieb von Pumpen und elektrischen Alternatoren zweckentsprechend. Leistung nach Anzahl der Zylinder von 460 bis 900 PS bei 375 U/min Mit Alternator gekuppelt gibt das Aggregat eine Leistung von 375-750 kVA. Sechszylindermotoren werden in Schiffsausführung für eine Leistung von 630 PS bei 350 U/min hergestellt Lieferung auch mit Turbogebläse möglich.

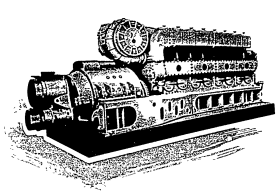
Slavia



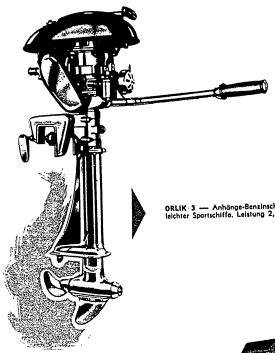
6 S 525 — Motor mit einer Leistung von 1500 PS bei 250 U/min, besonders zum Antrieb von Alternatoren mit 1250 kVA Leistung und von Pumpen für Bewässerungszwecke verwendet.



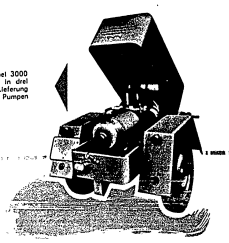
12 V 170 DK — Wassergekühlte Zwölfzylinder-Viertakt-Dieselmotoren.
Wegen sehr kleinem Gewicht und kleinen Abmessungen zum Antrieb verschiedener Schienenfahrzeuge und für sonstige Zwecke geeignet Nennleistung 450 PS bei 1400 U/min.



K 8 S 310 DR — Dieselmotor mit Turbogebläse, Leistung 1650-1800 PS bei 350-720 U/min. Hochleistungsfähiger Motor, geeignet für Lokomotiven und zum Antrieb von Generatoren, Schiffen und Pumpen.



ORLIK 3 — Anhänge-Benzinschiffsmotor und Antrieb leichter Sportschiffe. Leistung 2,5 PS bei 4000 U/min.



JIKOV — Benzinmotor Typ 8D 1 S 72A von 5,5 PS Leistung bei 3000 U/min, einen Alternator von 2,5 kW antreibend. Ausführung in drei Alternativen, als ortfestes, fahrbares oder tragbares Aggregat Lieferung auch mit Riemenscheibe zum Antrieb kleinerer Maschinen und Pumpen möglich

In diesem Prospekt sind bloss die grundlegenden Typen unserer Dieselmotoren angeführt. Das Produktionsprogramm der ŠKODA- und SLAVIA-Dieselmotoren ist ausserordentlich reichhaltig. Wir liefern alle Typen von Dieselmotoren für Industrie und Landwirtschaft mit Leistungen von bis 2000 PS, Dieselaggregate in ortfester und fahrbarer Ausführung mit Leistungen von 7,5 bis 1250 kVA sowie Schiffsdieselmotoren mit Leistungen bis 600 PS.

STROJEXPORT

PRAHA - TSCHECHOSLOWAKEI

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STROJEXPORT

Ortsfester Dieselmotor Škoda 6 S 350 PN

Wassergekühlter Viertakt - Sechszylinder - Reihenmotor mit direkter Kraftstoffeinspritzung und Aufladung. Der Aufbau des Motors, die für die einzelnen Teile verwendeten Werkstoffe und die Ausstattung mit Zubehör gewährleisten eine lange Lebensdauer und hohe Betriebszuverlässigkeit. Die hohe Leistung des Motors wird bei verhältnismässig geringem Gewicht erzielt. Der Motor wird zum Antrieb elektrischer Generatoren, Pumpen u.ä. verwendet.

Motorgehäuse.

Das zweiteilige, in der Kurbelwellenachse geteilte Motorgehäuse ist aus Gusseisen. Gegen Explosion ist am Kurbelgehäuse bei jedem Zylinder ein Sicherheitsdeckel vorgesehen.

Zylinderbüchsen.

Die wassergekühlten, herausnehmbaren Zylinderlaufbüchsen sind aus Spezialguss hergestellt.

Zylinderköpfe.

Die Zylinderköpfe sind aus Gusseisen und sind selbständig für jeden Zylinder vorgesehen. In jedem Zylinderkopf sind in besonderen herausnehmbaren Ventilkörben je 1 Einlass-, Auslass-, Einspritz-, Anlass- und Sicherheitsventil angeordnet.

Kolben.

Die Kolben sind aus einer vergüteten Spezial-Aluminiumlegierung hergestellt.

Kurbelwelle.

Die aus einem Stück geschmiedete Kurbelwelle ist im Motorgehäuseunterteil in 8 Gleitlagern mit hochwertiger Lagermetallauskleidung gelagert.

Pleuelstangen.

Die Pleuelstangen sind dreiteilig ausgeführt mit H-förmigem geschmiedetem Schaft und mit zweiteiligem aus Stahl abgegossenem Pleuelkopf. Die Pleuelstange ist sowohl auf der Kurbelwelle als auch im Kolben gleitend gelagert.

Drehzahlregler.

Der Drehzahlregler moderner Bauart mit hydraulischem Servomotor ist mit eigener Oelpumpe ausgestattet. Die Drehzahleinstellung erfolgt von Hand oder durch Fernsteuerung.

Schmierung.

Die Schmierung des Motors ist als Druckumlaufölschmierung mit ausserhalb des Motors angeordnetem Betriebsölbehälter gelöst.

Kühlung.

Die Kühlung des Motors ist als Durchfluss- oder Umlaufkühlung gelöst. Die Kühlwasserpumpe ist ausserhalb des Motors angeordnet.

Kraftstoffeinspritzung.

Jeder Zylinder hat seine eigene Kraftstoffeinspritzpumpe mit direktem Antrieb von der Steuerwelle.

Anlassen.

Der Motor wird mittels Druckluft angelassen.

Filter.

Der Kraftstoff wird vor dem Eintritt in die Einspritzpumpen durch einen umschaltbaren Doppel-Kraftstoffilter gereinigt. Das Oel wird in einem Grob- und in einem Feinölfilter gefiltert. Die Reinigung der angesaugten Luft erfolgt in einem Trockenluftfilter.

Turbolader.

Der wassergekühlte Turbolader von bewährter Konstruktion und hoher Lebensdauer ist mit einem Luftfilter ausgestattet. Der Turbolader besteht aus der Axialturbine und dem Radialgebläse, die in abgeferderten Wälzlagern gelagert sind.

Normalzubehör

(wird mit dem Motor geliefert)

1 Schwungrad mit Handandrehvorrichtung
1 Zahnradölpumpe
1 Durchschmier-Handölpumpe
1 Betriebskraftstoffbehälter

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1 Betriebsölbehälter
1 Grobölfilter
1 Feinölfilter
1 Oelkühler
6 Auspuffgasthermometer
6 Kühlwasserthermometer
1 Gerätetafel mit Manometer und Drehzahlmesser
1 komplette Einrichtung zum Anlassen des Motors mittels Druckluft
1 Handflügelpumpe zum Umpumpen des Dieselöls in den Betriebsbehälter
1 kompletter Turbolader
1 Satz Schlüssel und Werkzeuge
1 Satz normaler Ersatzteile zum Motor
1 Betriebsanweisung

Sonderzubehör

(wird auf besondere Bestellung und gegen Mehrpreis geliefert)

Einrichtung für indirekte Kühlung des Motors
Düsenprüfgerät
Luftkompressor zum Auffüllen der Druckluftflaschen (mit Elektromotor- oder Dieselmotorantrieb)
Kühlwasserpumpe mit Elektromotorantrieb
Einrichtung für die Ferndrehzahleinstellung
Fernthermometer mit Anzeiger
komplette Signalisieranlage mit akustischer und optischer Meldung der Motorstörung
weitere Ersatzteile nach besonderer Anforderung des Kunden.

Technische Angaben:

Nennleistung		1000 PS
Maximalleistung für die Dauer 1 Stunde		1100 PS
Nenndrehzahl		375 U/min
Zylinderbohrung		350 mm
Kolbenhub		500 mm
Anzahl der Zylinder (in Reihenanordnung)		6
Mittlere Koibengeschwindigkeit		6,25 m/sec
Mittlerer effektiver Druck auf den Kolben bei Nennleistung		8,35 kg/cm²
Drehzahl der Kurbelwelle bei Ansicht auf den Motor von vorn, d. h. von der dem Schwungrad abgekehrten Seite		linksdrehend
Kraftstoffverbrauch		165 g/PSh ± 5 %
Oelverbrauch		2–3 g/PSh
Anlassen des Motors		mittels Druckluft
Kühlung des Motors		Wasserkühlung
Schmierung des Motors		Druckölumlaufschmierung
Type des Turboladers		PDH 50
Maximal zulässiger Gegendruck im Auspuffstutzen hinter dem Turbogebläse		200 mm WS
Gesamtgewicht des Motors mit Schwungrad und Zubehör am Motor		23600 kg
Abmessungen des Motors	Länge	5680 mm
	Breite	1935 mm
	Höhe	3455 mm

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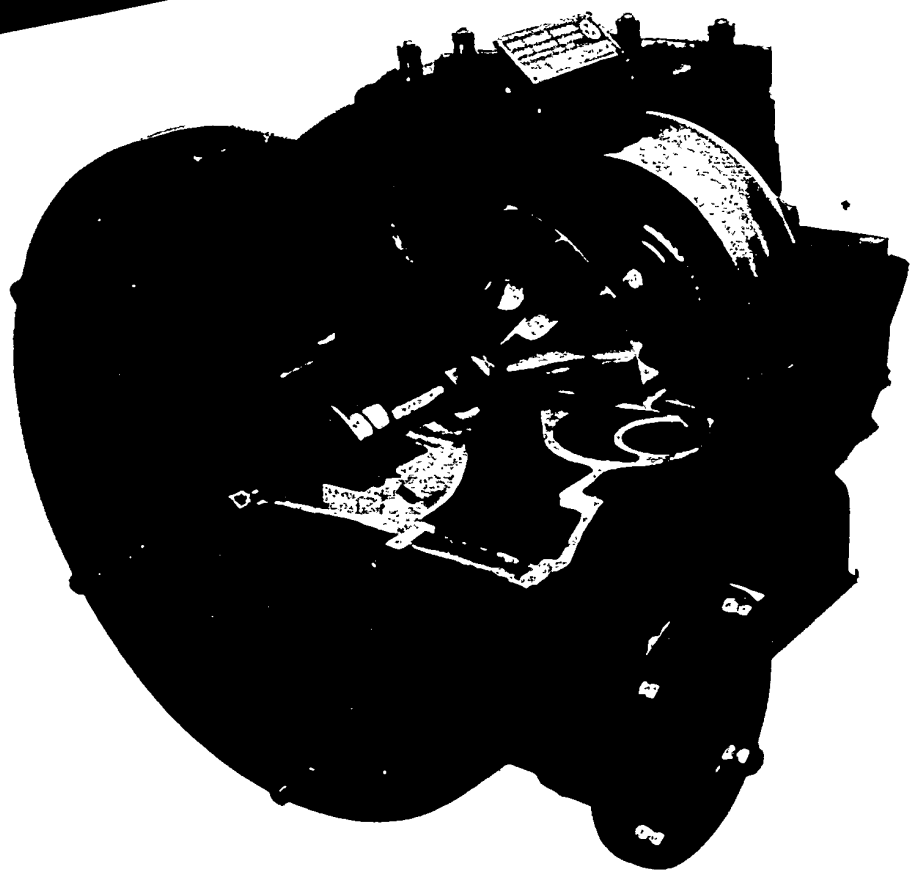
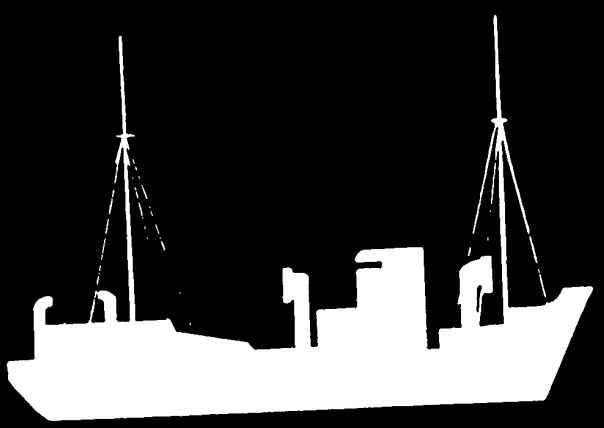


ROLADE



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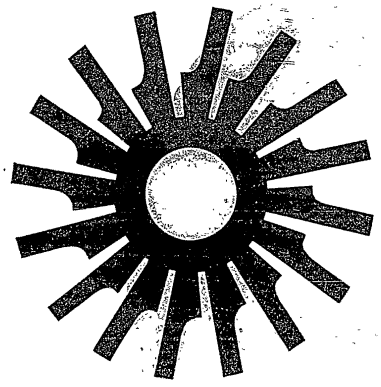

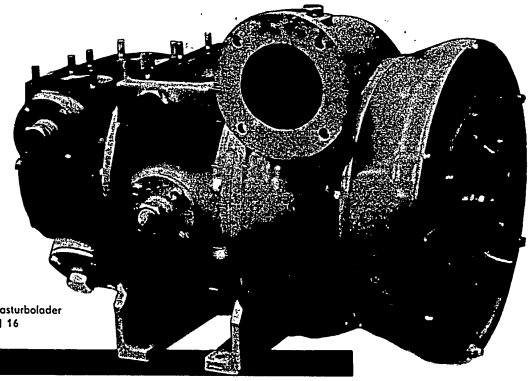

Abgasturbolader
PDH 16

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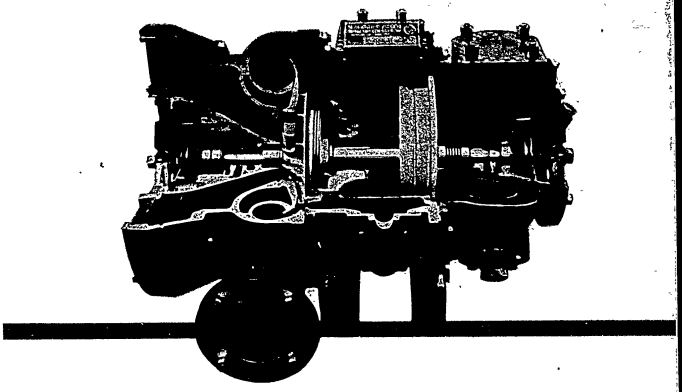
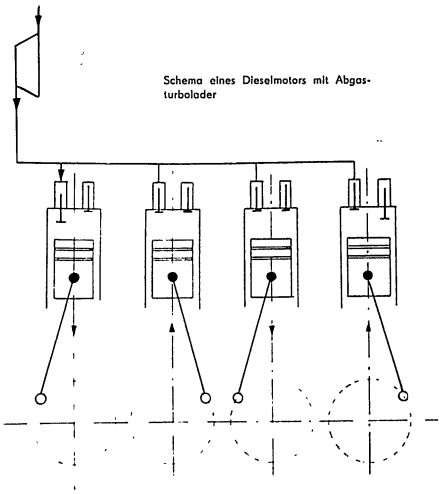


Schema eines Dieselmotors mit Abgasturbolader



BESCHREIBUNG DER ARBEITSWEISE DES TURBOLADERS

Die Auspuffgase des Dieselmotors werden durch eine Rohrleitung zur Abgasturbine geleitet, wo sie im Leitrad expandieren und in das Turbinenlaufrad eintreten und die Turbine antreiben.

Das auf gemeinsamer Welle mit der Turbine angeordnete Turbogebläse saugt die Luft an, verdichtet sie im Laufrad und die verdichtete Luft wird durch den Turbolader in die Saugrohrleitung des Dieselmotors befördert.

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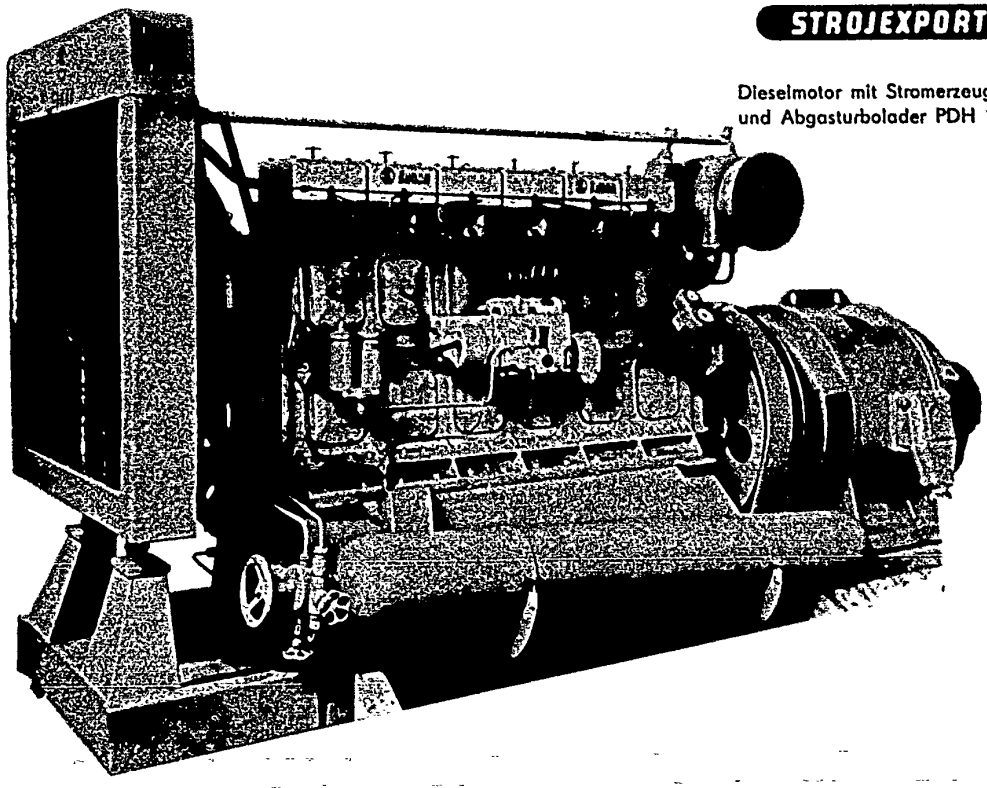
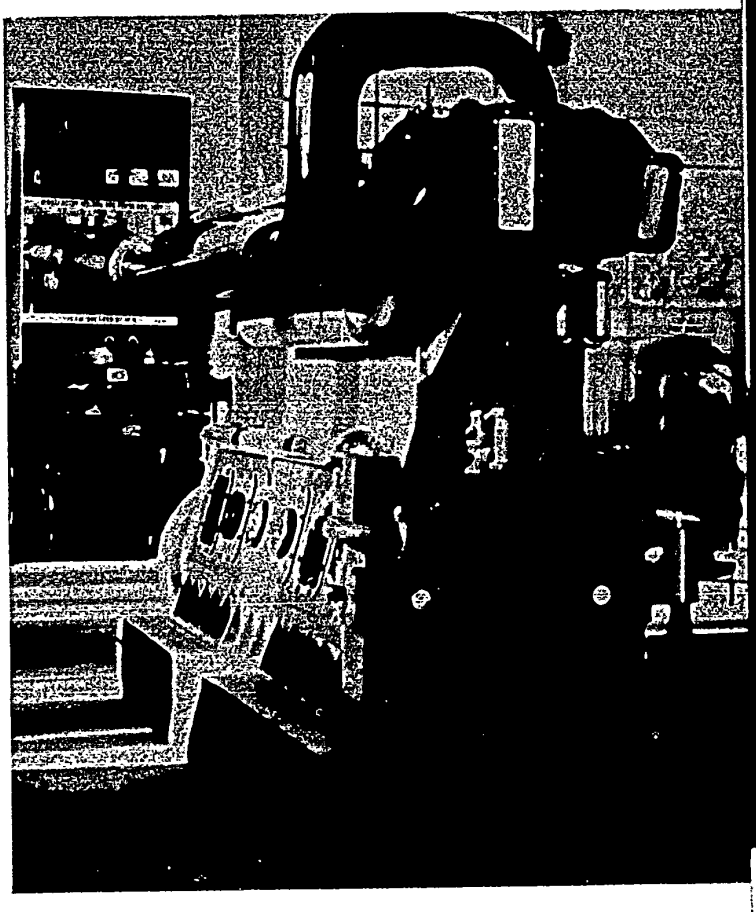


Dieselmotor mit Stromerzeuger und Abgasturbolader PDH 16

Schiffs-Dieselmotor mit Abgasturbolader PDH 35



LEISTUNG DES DIESELMOTORS

Die Leistung des Dieselmotors ist durch die Kraftstoffmenge, die in einer bestimmten Zeiteinheit wirtschaftlich im Motor ausgenutzt werden kann, bestimmt.

Bei Dieselmotoren ohne Aufladung (mit natürlicher Ansaugung) entspricht der Druck der angesaugten Luft dem atmosphärischen Druck der Umgebung. Mit Hilfe der Turbolader wird die Ansaugeluftmenge des Motors wesentlich erhöht, wodurch die Verbrennung einer grösseren Kraftstoffmenge und die Leistungserhöhung des Motors ermöglicht wird.

Die mit höherem Druck zugeführte Luft erleichtert die vollkommene Spülung (Verdrängung) der Auspuffgase und ermöglicht eine bessere Kühlung

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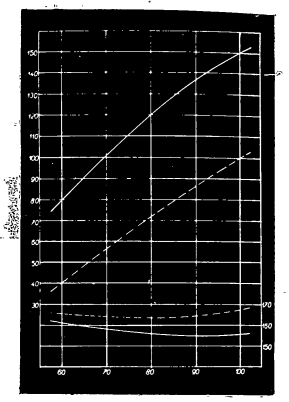
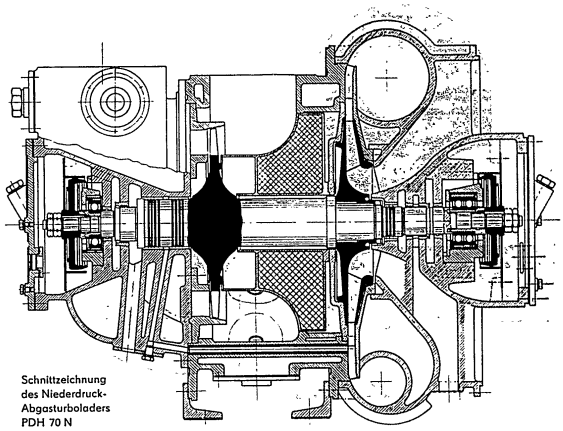
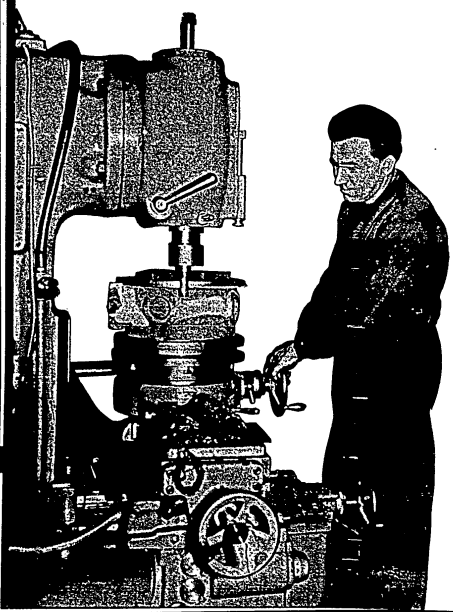
a) Leistung, b) Spezifischer Brennstoffverbrauch g/PS/h, c) Drehzahl %, d) Motor mit Abgasaufladung, e) Motor ohne Abgasaufladung



Leistung und spez. Brennstoffverbrauch des Motors mit Abgasaufladung und ohne Abgasaufladung



Schnittzeichnung des Niederdruck-Abgasturboladers PDH 70 N



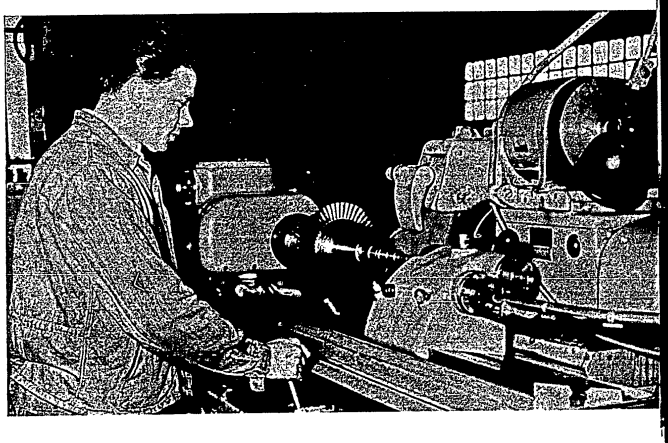
der Verbrennungsräume der Zylinder. Die mechanischen Verluste sind bei aufgeladenen Dieselmotoren die gleichen, wie bei Motoren ohne Aufladung.

In den Auspuffgasen gehen etwa 40 Perzent der durch die Verbrennung des Kraftstoffes in den Motoren erzeugten Wärmeenergie verloren. Ein Teil dieser Energie wird vorteilhaft zum Antrieb des Turboladers ausgenutzt und zurückgewonnen.

Je nach der geforderten Leistungserhöhung der Dieselmotoren werden verschiedene Arten von Turboladern erzeugt, die eine dauernde Leistungserhöhung bis um 120% gewährleisten, und zwar:

a) Niederdruck-Turbolader
b) Mitteldruck-Turbolader
c) Hochdruck-Turbolader

a) Durch Aufladung mit der Reihe der Niederdruck-Turbolader mit einem



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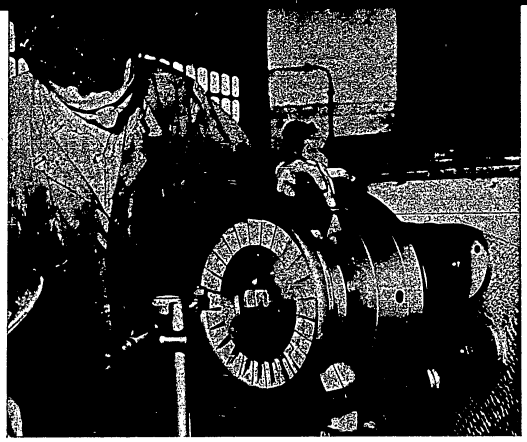
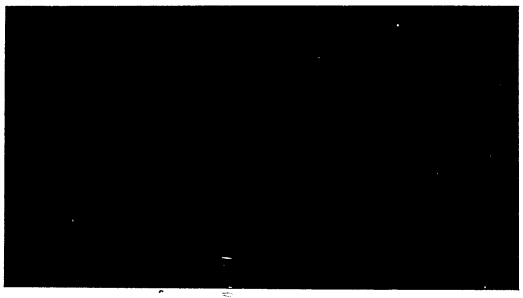
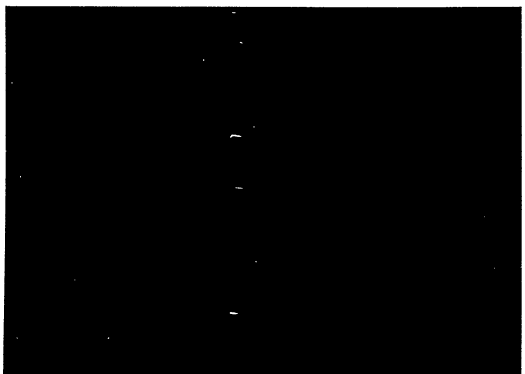


Kontrolle der Bearbeitung eines Leitrades



Abgasturbolader PDH - V (wassergekühlt)



Abgasturbolader PDH - S (wassergekühlt)

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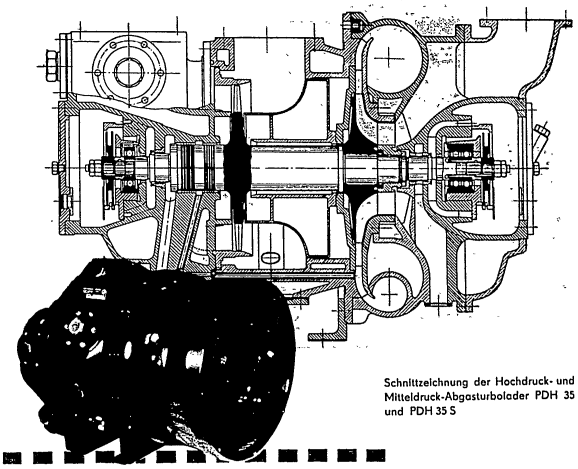
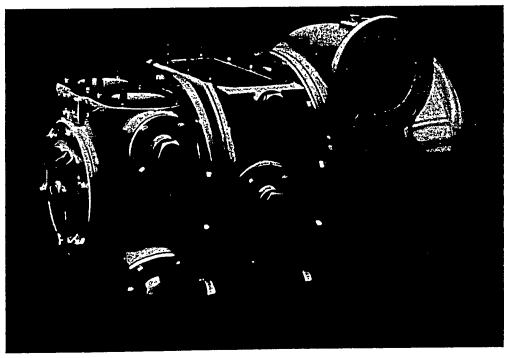


Schnittzeichnung der Hochdruck- und Mitteldruck-Abgasturbolader PDH 35 und PDH 35 S



Abgasturbolader PDH 16

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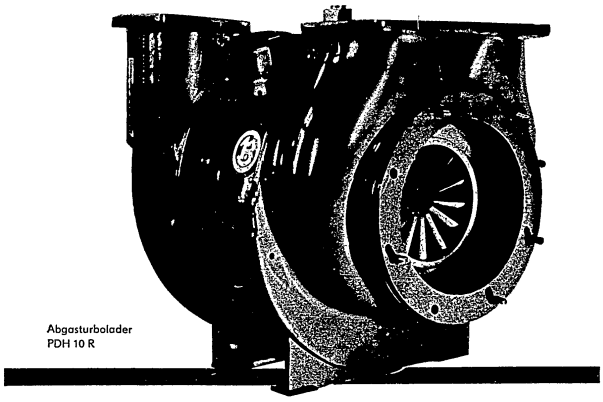
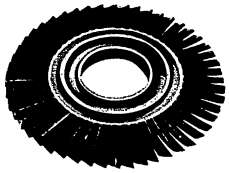
Typ	Angesaugte Nennluftmenge (745 tor bei 25°C)	Nennladedruck	Betriebsdrehzahl	Betriebstemperatur der Turbine	Leistungsbereich des Motors ohne Abgasaufladung	Gewicht (mit zweistufigem Gehäuse)
PDH	m³/h	ata	U/min	°C	PS	kg
16N	1600	1,35	21000	550	150-235	153
25N	2500	1,35	18000	550	235-400	220
35N	3500	1,35	15500	550	400-600	330
50N	5000	1,35	12200	550	600-1000	625
70N	7000	1,35	10200	550	1000-1500	920
100N	10000	1,35	8200	550	1500-2250	1480

Abgasturbolader
PDH - N
(wassergekühlt)

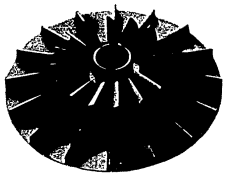


Abgasturbolader
PDH 10 R

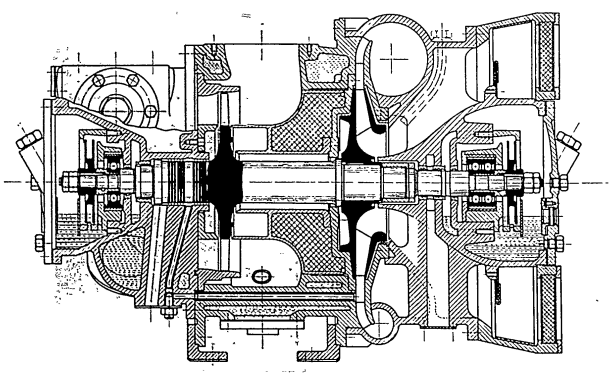
Gussstück des Turbinenlaufrades
PDH 16 S



Gussstück des Gebläserades
PDH 16 S



Schnittzeichnung des Niederdruck-Abgasturboladers PDH 25 N mit Luftfilter



Enddruck von 1,35 ata wird eine dauernde Leistungserhöhung der Motoren bis um 50% erreicht. Die höchstzulässige Dauertemperatur der Auspuffgase an der Turbine beträgt 550° C.

b) Mit Hilfe der Mittel-Turbolader mit einem Ladedruck von 1,65 bis 1,80 ata wird eine dauernde Leistungserhöhung der Motoren von um 50–80% erzielt.

Die höchstzulässige Dauertemperatur der Auspuffgasse darf an der Turbine 600° C nicht überschreiten. Bei höheren Ladedrücken ist es zweckmässig, die Ladeluft zu kühlen.

c) Mit Hochdruck-Turboladern mit einem Ladedruck von 1,8–2,2 ata wird eine dauernde Leistungserhöhung um 80–120% erzielt. Die höchstzulässige Temperatur der Auspuffgase an der Gasturbine beträgt 600° C. Bei Hochdruckaufladung ist Kühlung der Ladeluft erforderlich.

Läufer des Abgasturboladers PDH 35 N

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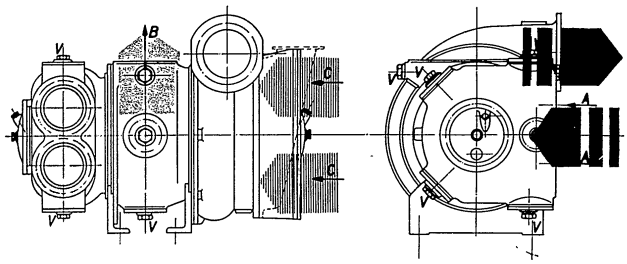
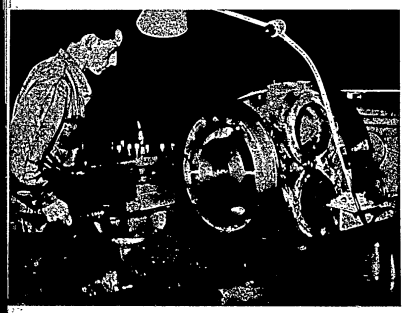
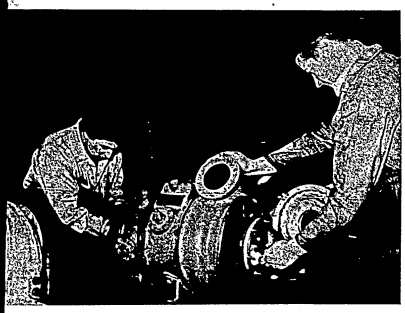


Ein- und Austrittsstutzen für Abgase und Luft des Abgasturboladers

A - Abgas-Eintritt,
B - Abgas-Austritt,
C - Lufteintritt,
D - Luftaustritt,
V - Wasseranschluss





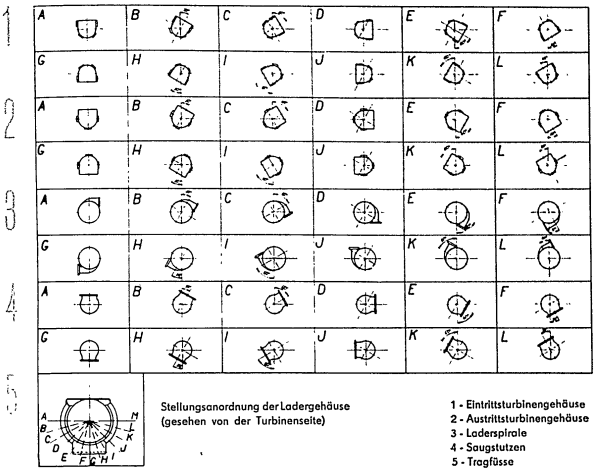
BESCHREIBUNG DES TURBOLADERS

Der Turbolader besteht aus einer einstufigen Abgasturbine und einem Zentrifugalgebläse, deren Rotorteile auf gemeinsamer Welle angeordnet sind, die in Wälzlagern im Stator gelagert ist. Den Stator bilden das Eintritts- und Austrittsgehäuse der Gasturbine und das Gebläsegehäuse.

Die Turbinengehäuse sind aus warmfestem Gusseisen abgegossen und mit einem Kühlmantel für den Umlauf des Kühlwassers versehen. Das Gebläsegehäuse ist aus Silumin, gegebenenfalls aus einer seewasserbeständigen Aluminium-Magnesiumlegierung abgegossen. Die Eintritts- und Austrittsturbinengehäuse, das Turbinen- und Gebläsegehäuse können gegenseitig um 30° verdreht und die Saugstutzen je nach der Anordnung des Motors in verschiedene Lagen verstellt werden.

Die Turbinenlaufräder mit Überdruckschaufeln sind aus warmfestem Stahl.

Die Schmierung des Turboladers ist von der Schmierung des Motors unabhängig.



Stellungsanordnung der Ladergehäuse (gesehen von der Turbinenseite)

1 - Eintrittsturbinengehäuse
2 - Austrittsturbinengehäuse
3 - Laderspirale
4 - Saugstutzen
5 - Tragfüsse

HAUPTVORZUGE UNSERER TURBOLADER

1. Der hohe thermodynamische Wirkungsgrad der Turbolader gewährleistet einen niedrigen spezifischen Kraftstoffverbrauch der Motoren.
2. Die geeignete Wahl der verwendeten Werkstoffe ist eine Gewähr für die lange Lebensdauer der Turbolader.
3. Hohe Betriebszuverlässigkeit, die durch Bewährungsproben sowie im Betrieb mit Dieselmotoren nachgewiesen wurde.
5. Möglichkeit der Anpassung an die Motoren, die durch das gegenseitige Verdrehen der Gehäuse und verschiedenartige Befestigung des Turboladers am Motor und durch die Auswechselbarkeit der Durchflussteile gesichert ist.

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Dieselelektrische Lokomotive mit Abgasturbolader PDH 70

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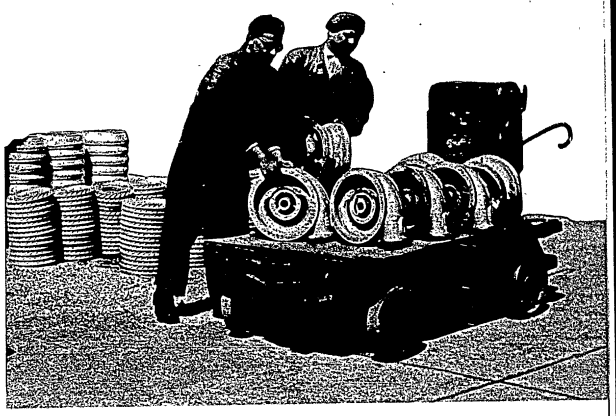
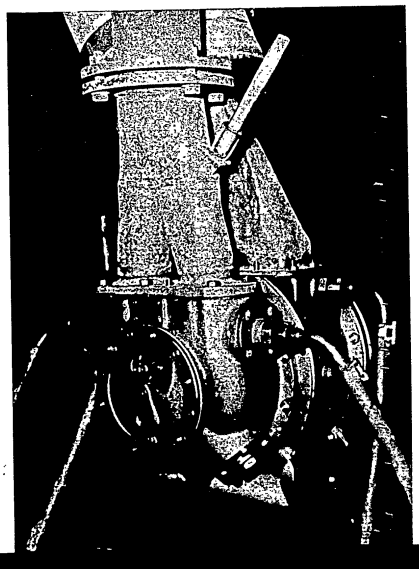


Für die Fabrikation der Abgasturbolader werden laufend hochwertige Gussstücke sichergestellt.



Jeder Turbolader wird im Erzeugerwerk einer Betriebserprobung unterzogen, bei der er als Gasturbine mit Verbrennungskammer arbeitet.

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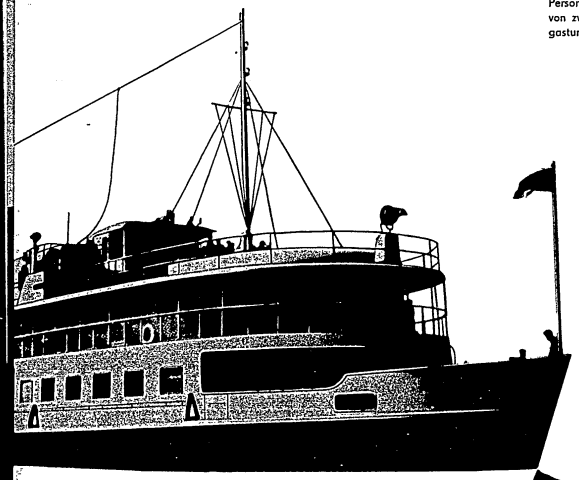

Personen-Flussschiff angetrieben von zwei Dieselmotoren mit Abgasturboladern PDH 35

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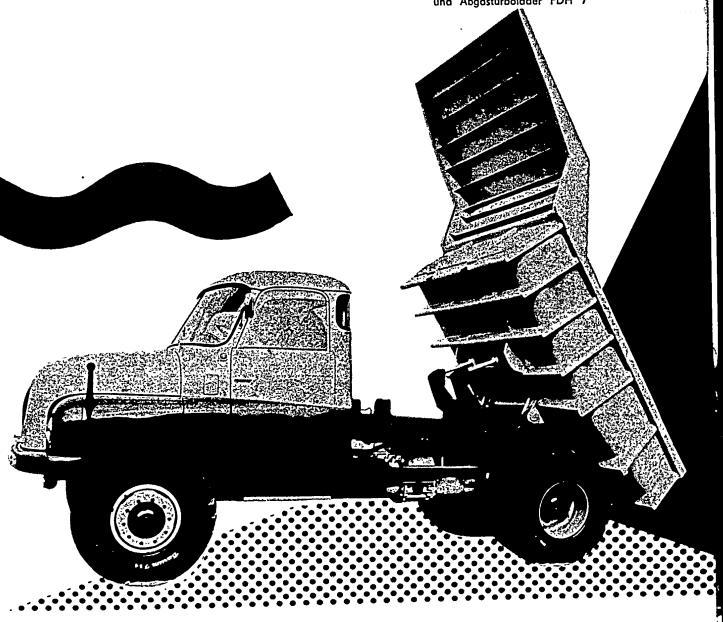
Modemer Maschinenpark gewährleistet die hohe Qualität der hergestellten Abgasturbolader

Lastkraftwagen mit Dieselmotor und Abgasturbolader PDH 7



Die tschechoslowakischen Turbolader werden in einem besonderen engspezialisierten Betrieb hergestellt, der mit einem modernen Maschinenpark ausgestattet ist. Die Erzugung von Turboladern wurde auf Grund langjähriger Konstruktions- und technologischer Erfahrungen, die bei der Herstellung von Dampfturbinen, die sich auf zahlreichen Auslandsmärkten hervorragend, bewährt haben, gewonnen wurden, aufgebaut. Dieses Spezialunternehmen hat seinen eigenen Betriebs- und Entwicklungsprüfstand, deren vollkommene Einrichtungen die Verwendung genauester Messmethoden ermöglichen, wodurch eine hohe Qualität und Betriebszuverlässigkeit der gelieferten Turbolader gewährleistet wird.

Dieselmotoren mit Aufladung durch Turbolader kommen überall dort zum Einsatz, wo bei beschränkten Abmessungen des Raumes für den Motor hohe Leistungen verlangt werden (Lokomotiv-, Schiffs-, Kraftwagen- und andere Dieselmotoren).

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DIE ERSTE BRÜNNER MASCHINENFABRIK

fabriziert Abgasturbolader nach werkseigenen Konstruktionen für Dieselmotoren jeder Leistung.

Ausenhandelsunternehmen

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liefert unsere Abgasturbolader den Kunden in der ganzen Welt.

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VÝSTAVNÍ PLOCHY VOLNÉ

2 b	Silnoproudá zařízení – ČSR
5 a	Kolektivní exposice SSSR, Maďarska, Bulharska, Rumunska
6	Kolejová vozidla – ČSR
7	Čerpadla – ČSR i zahraniční vystavovatelé
9 a	Stavební a silniční stroje – zahraniční vystavovatelé
11 a	Stavební a silniční stroje – ČSR
12 a	Kolová vozidla – zahraniční vystavovatelé
12 b	Kolová vozidla – ČSR
13 a	Zemědělské stroje – zahraniční vystavovatelé
13 b	Zemědělské stroje – ČSR
14 a	Předváděště motocyklů – ČSR
14 b	Letectví – ČSR
15	Předváděště zemědělských strojů – ČSR

SLUŽBY

I	Nová administrativní budova
I a	Cizinecké středisko
II	Hlavní vstup na výstaviště
II a	Boční vstup
III	Hlavní východ
IV	Vinárna
V	WC
VI	Tiskové středisko
VII	Restaurace
VIII	Divadlo Julia Fučíka, promítání technických filmů s přednáškami
IX	Rampa – Sovětská kniha
XI	Oddychová plocha – prodejní stánky
XII	První pomoc
XIII	Zámeček – výběrová restaurace
XIV	Obvodové komunikace
XV	Místní rozhlas
XVI	TURISTA – kanceláře
XVII	SNB – ztráty, nálezy
N	Technomat, Benzina Rampa, Mototechna, Technoexport – kanceláře
O	Film, rozhlas, televize
T	Krajská správa spojů, Vědecká technická společnost

CHCETE MÍT VLASTNÍ DRUŽSTEVNÍ BYT NEBO RODINNÝ DOMEK?

SPOŘTE PRAVIDELNĚ

PŘIHLASTE SE DO PODNIKOVÉHO NEBO STAVEBNÍHO SPOŘENÍ U NEJBLIŽŠÍ

STÁTNÍ SPOŘITELNY

O 21 1377-59 Q 007869

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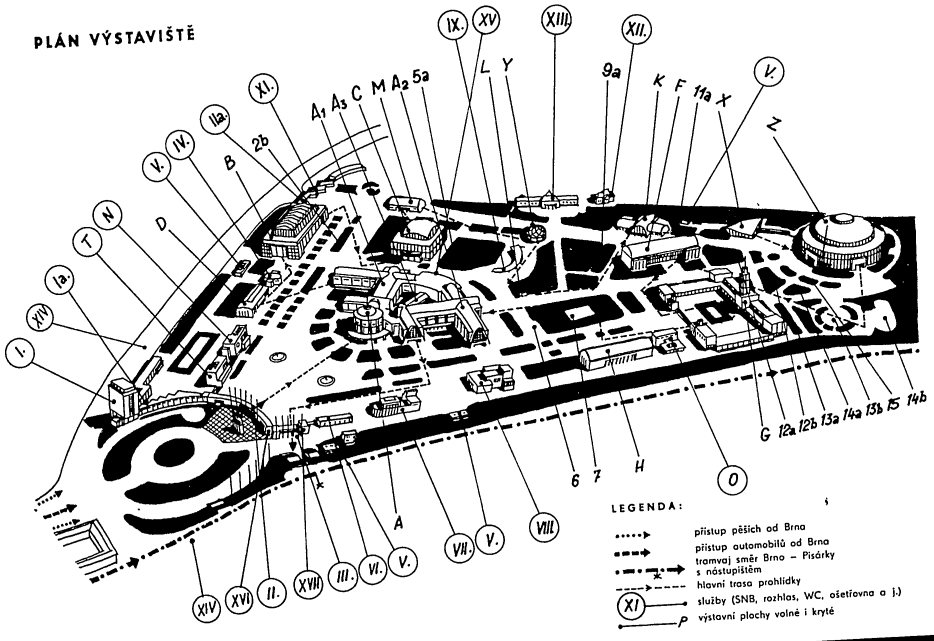
BRNĚNSKÉ VZORKOVÉ VELETRHY 1959

PLÁN VÝSTAVIŠTĚ



VÝSTAVNÍ PLOCHY KRYTÉ

A	Slavnostní nástupní prostor, polyekran
A 1	Kolektivní exposice SSSR a Bulharska
A 2	Kolektivní exposice Číny a Maďarska
A 3	Novinová služba, Státní nakladatelství technické literatury TECHNOEXPORT – vzduchotechnika STROJEXPORT – povrchová úprava, armatury Výzkumný ústav bezpečnosti práce zahraniční vystavovatelé. NSR, Lichtenstein
B	FERROMET, TECHNOEXPORT – vodní energetika, kotle, parní energetika, investiční celky, parní turbiny, Kaplanovo kolo STROJEXPORT – obráběcí a tvářecí stroje, vrtačky, brusky, soustruhy, silnoproudá zařízení zahraniční vystavovatele Rakousko, Francie, Švýcarsko, Švédsko, Itálie, NSR, Belgie, Finsko, Japonsko, Holandsko
C	KOVO – textilní stroje a jejich příslušenství, obuvnické stroje, měřicí přístroje, přesné nástroje, ložiska, šicí stroje, psací a kalkulační stroje, Chronotechna - elektročas, polygrafické stroje OMNIPOL – lovecké a sportovní zbraně UNICOOP – zařízení kanceláří, dílen, obchodů a domácností zahraniční vystavovatelé: Belgie, NSR, Itálie, Anglie, Švýcarsko, Francie, Holandsko, Rakousko, Norsko
D	Zahraniční vystavovatelé Anglie, NSR, Rakousko, Belgie
F	Kolektivní exposice Polska
G	KOVO – slaboproudé elektropřístroje ARTIA – gramo, gramodesky zahraniční vystavovatelé Dánsko, NSR, Švýcarsko, Francie, Finsko
H	Kolektivní exposice NDR
K	Kolektivní exposice Rakouska
L	Mannesmann, NSR – práškové metalurgie
M	TECHNOEXPORT, MOTOKOV – dřevozpracující stroje zahraniční vystavovatelé. NSR, Švédsko, Francie
X	STROJEXPORT – dieselmotory, převodovky a variátory TECHNOEXPORT – kancelář
Y	kolektivní exposice Rumunska
Z	MOTOKOV – chladírenství, auto, moto, kola, potravinářské stroje, kuchyňská zařízení, elektrospotřebiče KOVO – potravinářské stroje, speciální laboratorní přístroje, léčebná mechanika, foto-kino-optika TECHNOEXPORT – chladírenství, chemie, potravinářská zařízení STROJEXPORT – potravinářské stroje, kompresory, čerpadla OMNIPOL – letadla zahraniční vystavovatelé kolektivní exposice Kanady, Indie, Jugoslavie, Iraku, Tunisu Dánsko, Francie, NSR, Švýcarsko, Itálie, Anglie, Švédsko, Rakousko, Japonsko, Holandsko, Španělsko, Portugalsko METALIMEX, CHEMAPOL, SKLOEXPORT, CENTROTEX, ČS. KERAMIKA

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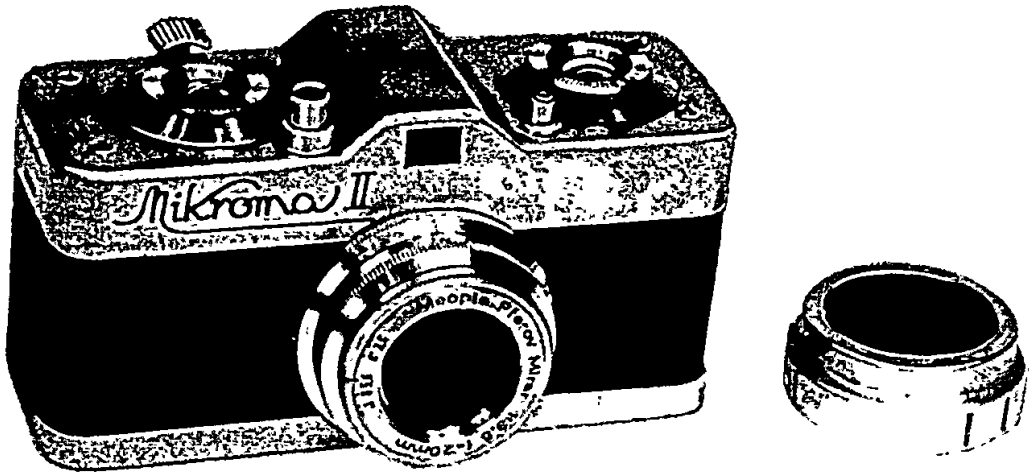
MVS

MINISTERSTVO [illegible] STROJÍRENSTVÍ

Fotografická komora MIKROMA II

Nomenklatura 1958 MVS 2.21.6012.02 Technické přejímací podmínky č. 262



Použití:

Mikromou II se pořizují fotografické snímky velikosti 11×14 mm Lze ji použít téměř pro všechny druhy fotografie, zvláště pak pro barevné diapositivy, portréty a reprodukce. Je určena jednak pro potřebu amatérů, jednak pro účely vážných fotografických a vědeckých pracovníků

Popis:

Mikroma II je miniaturní plně automatický fotografický přístroj pro 50 snímků velikosti 11×14 mm na kinematografickém filmovém pásu šířky 16 mm, maximální délky 90 cm. Posunutím táhla se přesune film vždy o 1 obrázek, natáhne závěrka a počitadlo zaznamená další snímek. Osvit se provede stisknutím komorové spouště. Ovládací táhlo a spoušť jsou vzájemně spřaženy, nelze tedy posunout film na další snímek, nebyl-li proveden osvit a nelze také stisknout spoušť, nebyl-li film přesunut Tím je znemožněn dvojí osvit jednoho políčka, nebo posunutí filmu bez osvitu.
Film, uložený v zásobní kasetě, vkládá se do přístroje při denním světle Osvětlený film se navíjí při fotografování na cívku v navíjecí kasetě.
Zaostřování objektivu je centrální se zaskakováním. Mikroma II má komorovou spoušť se závitem pro spoušť ohebnou a přípojku pro synchronní zážeh bleskové lampy Komora má stativovou matici 1/4" Zadní víko přístroje je odnímatelné.

Technické údaje:

Objektiv: speciální, tříčočkový anastigmat Mirar 1 3,5 f = 20 mm s velkou rozlišovací schopností v zaostřovací objímce s irisovou clonou a krytkou

Zaostřování: centrální, otáčením zaostřovací objímky se zaskakovacím zařízením, se stupnicí od 0,5 m do ∞.

Hledáček: optický, průhledový

Závěrka: speciální konstrukce, řiditelná pro čas B a momenty od 1/5 do 1/400 vteřiny

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Časovací točítko lze nastavovat v libovolném směru, a to před nebo i po natažení závěrky

Spoušť. komorová, tlačítková se závitem pro ohebnou spoušť Spouštění je blokováno s přetačecím mechanismem filmu.

Počitadlo: samočinné s dělením pro 50 snímků Počitadlo je rovněž blokováno proti nežádoucímu přestavení

Přípojka pro blesk: kontakt pro připojení kabliku k synchronnímu zážehu bleskové lampy je na horním víku komory, při nastavení závěrky do 1/25 sec. lze použít libovolného bleskového světla, u kratších momentů bleskových elektronických lamp.

Rozměry: 75×43×40 mm

Váha 230 g.

Zvláštní příslušenství:

1 Kožená pohotovostní brašna s řemínkem k nošení v ruce nebo na krku
2 Barevné fotografické filtry z broušeného a leštěného optického skla, barveného ve hmotě, v kovových objímkách se závitem k našroubování do objímky objektivu

a) G 1 — světle žlutý,
b) G 2 — středně žlutý,
c) G 3 — tmavě žlutý (oranžový)
d) GGR 1 — žlutozelený,
e) GR 1 — zelený,
f) R 1 — světle červený,
g) B 1 — světle modrý,
h) UV — téměř bezbarvý

Filtry se dodávají buď jednotlivě v krabičkách z průhledné umělé hmoty, nebo jejich celá sada ve speciálním plochém koženém pouzdře

3. Předsádková čočka pro snímky drobných předmětů a reprodukce ze vzdálenosti 33 cm
4 Náhradní kasety zásobní
5. Náhradní kasety navíjecí (s cívkou)
6 Pouzdra pro kasety
7 Navíjecí tyčinka k navíjení a odměřování filmu do zásobní kasety
8. Vyvolávací nádoba
9 Zvětšovací přístroj Mikromax
10. Projektor Mikromar k promítání diapozitivů
11. Prohlížečka pro diapozitivy
12. Řezačka 11×14
13 Reprodukční zařízení
14. Diarámky oblepovací
15. Diarámky z plastické hmoty

Mimotržním odběratelům dodává tyto přístroje podnik st obchodu Řemeslnické potřeby, Praha 2, Karlovo nám 15, Brno, Janská ul 7, Bratislava, Šmeralova 33

R 110449 MTZ 11 59 Po 40,8 2295

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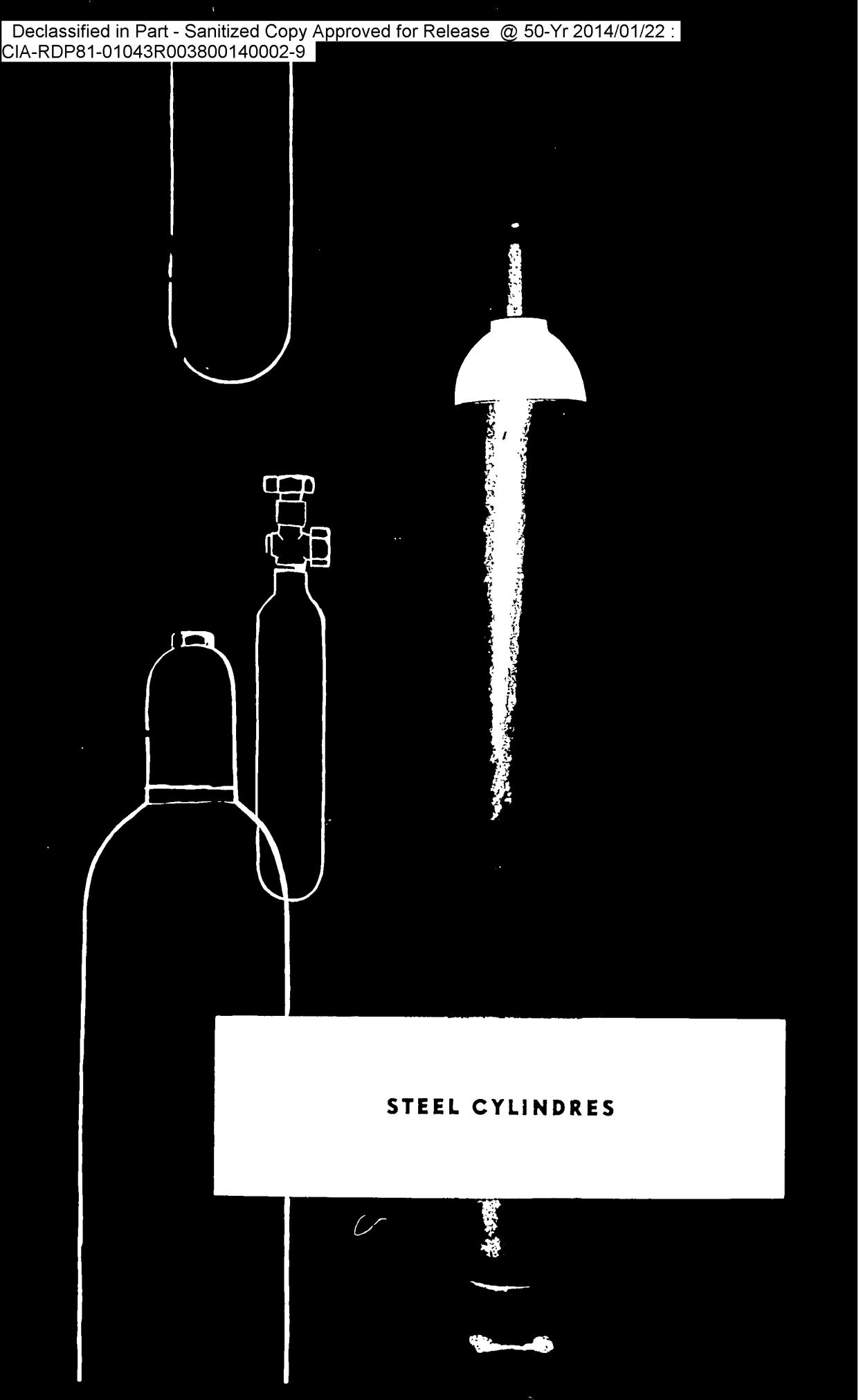

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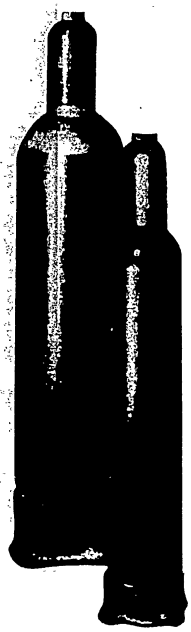


The steel cylinders, made of seamless steel tubes, for compressed, liquified and dissolved gases are used in all branches of industry, trade, repair and mechanic shops, laboratories and their use is limited only to such gases for which they are specially manufactured. The filling gas name is clearly stamped on each steel cylinder.

When filled carefull handling and protection from possible disastrous effects of high temperature is necessary.

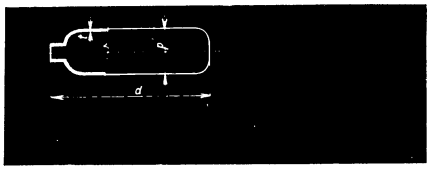
1. STEEL CYLINDERS FROM SEAMLESS STEEL TUBES FOR COMPRESSED GASES

(oxygen, hydrogen, nitrogen, compressed air, argon, ethylen, exhilarating gas, carbon monoxide and coal gas).

Material: Siemens-Martin steel.

Use: Industry, autogenous welding, medicine and chemistry.

Valves: For combustible gases right-hand connection threads.
For incombustible gases left-hand connection threads.



Water contents	Outside diameter	Wall thickness	Lenght	Weight		Filling pressure at max. 15 °C	Testing pressure
	p	t	d				
l	mm	mm	mm	kg		kg/cm²	kg/cm²
0,47	60	3	275	1,2	without foot ring, cap and valve	150	225
1,00	84	3,50	285	2,3	without foot ring, cap and valve	150	225
2,00	103	4,75	375	4,6	without foot ring, cap and valve	150	225
10,00	140	6,00	880	23	with foot ring, cap and valve	150	225
20,00	204	8,75	875	46	with foot ring, cap and valve	150	225
40,00	204	8,75	1590	75	with foot ring, cap and valve	150	225

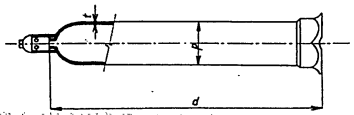
2. STEEL CYLINDERS FOR LIQUIFIED GASES

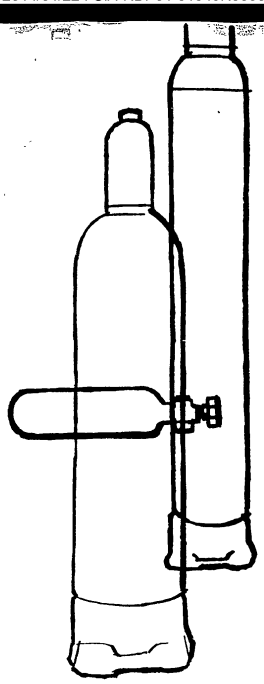
with thinner walls, proportional to the smaller pressure of liquified gases (chlorine, sulphur dioxide, methyl-chloride, ethyl-chloride, ethylen-oxide, methyl-amine, methylen-oxide, methylen-chloride, dimethyl-ether, phosgen, hydrogen-chloride).

Material: Siemens-Martin steel.

Use: Chemistry and Industry.

Water contents	Outside diameter	Wall thickness	Lenght	Weight with foot, ring, cap and valve	Testing pressure of 60 atms.
	p	t	d		
l	mm	mm	mm	kg	
10	140	5	850	16,5	60
20	204	5,5	810	27	60
40	204	5,5	1.490	43	60
80	267	6,5	1.750	92	60

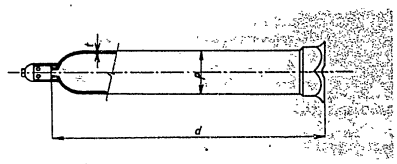




3. STEEL CYLINDERS FOR CARBON DIOXIDE.

Material: Siemens-Martin steel.

Use: Medicine and fire-extinguishers.

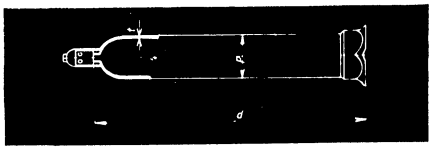


Water contents	Gas content	Outside diameter	Wall thickness	Lenght	Weight with feet, ring, cap and valve	Testing pressure
		p	t	d		
l	kg	mm	mm	mm	kg	kg/cm²
0,50	0,37	60	3,00	275	1,2	190
1,00	0,75	84	3,5	285	2,20	190
1,34	1,00	108	4,00	250	3,00	190
2,00	1,50	102	4,25	365	3,90	190
2,68	2,00	108	4,00	415	3,80	190
5,36	4,00	140	5,00	500	9,20	190
8,04	6,00	140	5,00	710	17	190
10,72	8,00	140	5,00	920	21	190
13,40	10,00	140	5,00	1,120	24	190
26,80	20,00	204	7,5	1,100	47	190
33,50	25,00	204	7,5	1,340	60	190
40,20	30,00	204	7,5	1,580	60	190

4. STEEL CYLINDERS FOR DISSOUS-GAS.

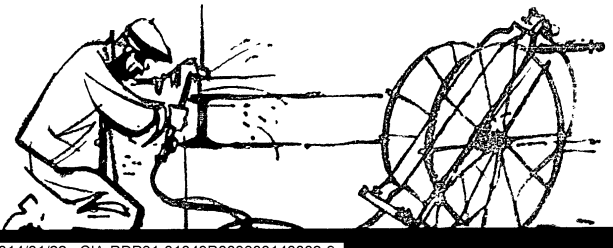
Material: Siemens-Martin steel.

Use: Industry, (welding).



Water contents	Outside diameter	Wall thickness	Lenght	Weight with foot, ring, cap and valve	Filling pressure at max. 15 °C	Testing pressure
	p	t	d			
l	mm	mm	mm	kg	kg/cm²	kg/cm²
20	204	5,5	840	28	15	60
40	204	5,5	1500	43	15	60

It is necessary to apply the porous substance before the delivered steel cylinders are filled with dissous-gas.



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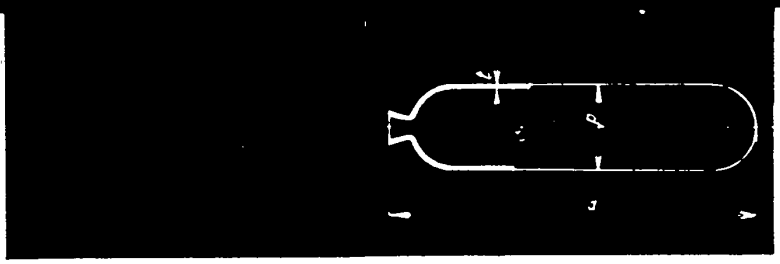
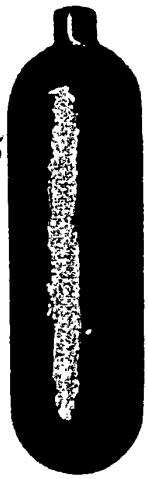
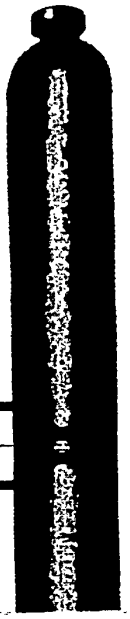
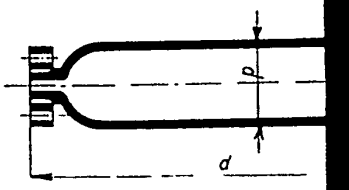
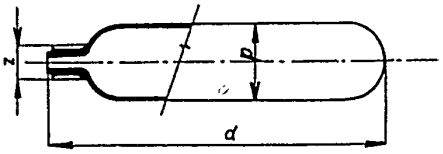










5. LIGHT STEEL CYLINDERS FOR COAL GAS OR METHANE.

Material: Chromium-nickel-molybden steel.

Use: For motocars, lighting, heating, etc.
(Filling pressure 200 atms., testing pressure 300 atms., painted, without foot, ring and protecting cap.)

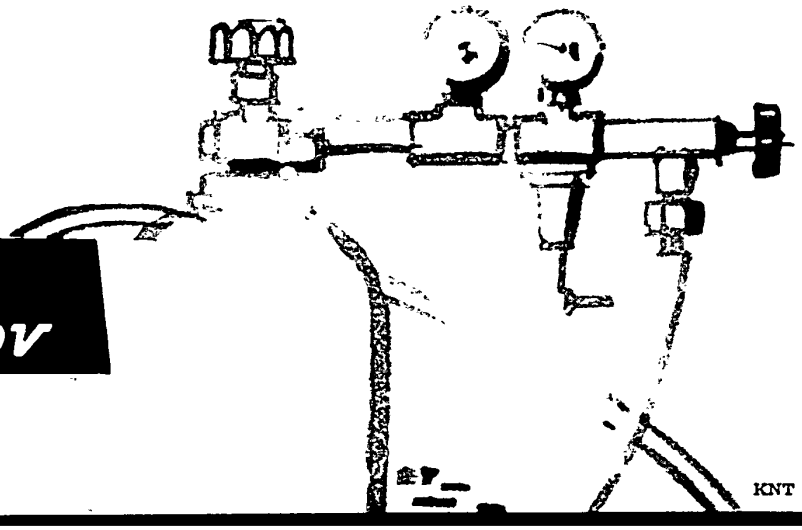
Water contents	Gas content	Outside diameter p	Wall thickness t	Lenght d	Weight
l	m³	mm	mm	mm	kg
28	5,6	229	6,5	900	35
80	16	267	7,8	1,800	95

6. STEEL CONTAINERS FOR COMPRESSED AIR made of steel tubes.

Use:

Water contents l	Outside diameter p mm	Lenght d mm	Branch thread z	Weight approx. kg	Working/testing pressure atms.
20	203	830	R 2"	23	35/55
28	203	1 100	R 2"	30	35/55
50	267	1 700	R 2"	50	35/55
50	267	1 200	R 3"	50	35/55
75	267	1 700	R 2"	80	35/55
75	267	1 700	R 3"	80	35/55
75	318	1 245	R 2"	80	35/55
100	267	2 200	R 2"	101	35/55
150	318	2 300		185	50/75
150	318	2 350		146	50/75
230	368	3 000		520	175/265
250	356	3 400		414	150/225
250	356	3 600		720	250/375
200	318	3 160		226	50/75
300	318	4 660		334	50/75
302	368	3 600		404	50/75

The weights and dimensions given are not binding.



MOTOKOV

KNT 01 — 5013-58

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Dear Sir,

Motokov, a foreign trade corporation, has much pleasure in extending to you its heartiest welcome on your arrival in Brno, our new town of International Fairs, and in wishing you a pleasant and successful stay.

Not only the town of Brno, but we too, will consider it a pleasant duty to make your stay with us as agreeable as possible.

Enclosed you will find an information booklet for journalists, and we do hope that you will make abundant use of its contents in your journalistic activities in your country. It contains, among other things, data concerning our export programme.

Should you have any wishes or questions our executives at our stands in pavilion Z will be pleased to attend to them.

It is our sincere wish that you will enjoy your stay in the Czechoslovak Republic and that back at home you will gladly recall your sojourn with us on the occasion of the I. Sample Fair in Brno 1959.

May our co-operation with you be a pleasant and profitable one ! With best wishes

Yours sincerely,

K. Zapletal

Chief of Publicity Department.

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For Enthusiasts Preferring Small Capacities

Even before the Second World War motorcycles of 500, 750 and 1000 c.c. were standard types to be seen everywhere. In America, the majority of motorcycle production ranges among the 750 and 1000 c.c. swept volumes even now. A swept volume in the region of 1000 c.c. or 61 cu.in. is considered to be quite appropriate for medium size motor cars with a seating capacity of four passengers, a category in which rather high requirements regarding speed and endurance of the vehicle are to be complied with.

This trend towards ever lower swept volumes or cubic capacities can be seen in Czechoslovakia also with motorcycles and all single-track vehicles. At present, the JAWA/ČZ motorcycles are standardly produced up to a swept volume of 350 c.c., while the JAWA/ČZ 250 and 350 c.c. types are often fitted with sidecars for an additional third passenger, without appearing to be in the least overloaded. New light structures, higher r.p.m. of the engine and a general technological improvement have effected a notable influence.

This development has today reached a stage likely to leave a motorcyclist from the thirties of our century rather breathless. To prove the above facts, it is sufficient to have a look, for instance, at the latest products of the Czechoslovak factories: the Stadion moped, the smallest JAWA motorcycle, both having a swept volume of not quite 50 c.c., and the up-to-date Manet scooter for two persons which has a swept volume of 100 c.c.

The Stadion moped represents today in Czechoslovakia the lightest of the inland-made motor vehicles. It weighs a mere 38 kg or 83.77 lb, having a power output of 1.5 HP at 4,250 r.p.m. and developing a speed of 45 km or 28 m.p.h. The moped is equipped with the well-proven air-cooled, two-stroke, single-cylinder JAWA engine.

And what can it boast of?

In the first place, of high popularity among numerous motoring enthusiasts who are not quite crazy about handling a vehicle which can be called a "spitfire".

Let us add immediately that these enthusiasts do not cherish by far the motto "Festina lente" /hurry slowly/. It can best be proved by a practical example. Shortly after the new moped was built in 1957, the wish was expressed to "punish" the new vehicle hard directly in the field. For this purpose, a winter trip was chosen over the highest Czechoslovak mountains, the High Tatras, to Warszaw and back, and later additional trips under equally difficult conditions - high temperature this time - to Rumania and Bulgaria. The new model passed all these trials with flying colours, without the least defect. The

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daily laps ranged between 250 and 350 km or 155 and 217 miles, the cruising speed being 45 to 50 km or 28 to 31 m.p.h.

This is by far not a bad average even for a much more powerful vehicle under normal conditions. Moreover, let us point out that this moped has been actually designed for shortish comfortable trips to work, pleasure trips, etc. No wonder that this moped which has shown such performance characteristics and such thriftiness with regard to servicing along with absolute reliability during the two years of its life, has found a wide circle of prospective customers, particularly female ones, even among the highly discerning motorcycle fans of Czechoslovakia. This is naturally due also to its minimum consumption; something over one and a half litre of fuel per 100 km or 188 m.p. I.gall., and obviously the equally smart and most purposeful design which pays special attention to the maximum possible riding comfort. While the moped is fitted with pedals enabling the driver to be propelled by his /or her/ own power, the other model, the smallest Czechoslovak motorcycle, the JAWA 555, is a motorcycle in the true sense of the word. It rightly belongs to the family of "thoroughbred" JAWAs, due both to its power output, performance and appearance. Having a power output of 2.2 HP, it has a swept volume of not quite 50 c.c., develops a speed of 60 km or 37.3 m.p.h. and can readily carry a rider with luggage up to a weight of 130 kg or 286.6 lbs. In addition, the fuel consumption is also extremely low: approximately 1.8 litres per 100 km or 156.66 m.p.I.gallon. The front wheel is sprung with telescopes, the entire motorcycle being faired similarly to all the JAWAs; in addition to all the advantages of easy washing and servicing, this design results in the extremely smart appearance of the cycle. As a novelty of this year, this equally thrifty and useful vehicle will be presented in a scooter version which, while slightly increased in weight and maintaining all the existing performance characteristics, will protect the rider better against dust or mud from the road. Another alternative is the motorcycle fitted with a dual seat, designed mainly for higher riding comfort during longish trips. The dual seat ensures full riding comfort as well as change of position, so important for conquering fatigue during long tours.

The latest type of the smallest swept volumes in single-track motor vehicles in Czechoslovakia is the Manet scooter. Having a swept volume of 100 c.c. only, it can nevertheless easily carry two persons. Though developing a speed of 75 km or 46.6 m.p.h., it has a fuel consumption of a mere 2.3 litres of fuel, i.e. covers 123 miles per Imperial gallon. Its designers have born in mind also trips along roads

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which are in poor condition, as evidenced by the larger diameter of the wheels 14". Thus, extremely advantageous riding characteristics of this vehicle are ensured. When realizing that the bodywork of the vehicle not only gives it an exceptionally elegant styling, but actually protects the rider against dust and mud from the road, it is apparent what an advantageous type has been manufactured in this scooter. Other items ensure the "big" vehicle appearance of the Manet scooter. It has an electric starter motor for the easiest starting of the engine, again a courtesy to ladies from the designers of this scooter, similarly as the direction indicators or trafficators which facilitate the steering of the machine. When Manet has been demonstrated at big international events, the representatives of motoring world have agreed that the Manet is The Scooter of 1959, due particularly to its original design, being the type of scooter which possesses everything, the most discriminating owner of such a vehicle can desire.

A similar opinion, still more important for the makers of the Manet, reflected in the extraordinary interest of the motoring world.

As can be seen from the data quoted, the low and lowest swept volumes, have great possibilities to equal their more powerful colleagues. It is due to the merit of the Czechoslovak designers that they have ensured the full display of all the outstanding features of these motorcycles by a refined design, while the craftsmen have added perfect craftsmanship in every detail as well as in the whole.

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Novelties for the Meat-Processing Industry

The exhibited equipments are new products of the National Corporation ČKD Choceň. In order to increase productivity of work and hygiene in meat-processing workshops there have been developed up-to-date highly efficient machines which may be applied both in big plants of the meat-processing industry and in small workshops of a retail character. The construction of these machines enables not only their arrangement in manufacturing lines but also their independent application.

The type 112 Meat Mincing Machine with automatic feed is intended for mincing all sorts of boned meat, both frozen and fresh, for the manufacture of sausages. The output of this mincing machine ranges from 1500 up to 2000 kg/hr. according to the kind of treated material and its grain-size. The high efficiency and the automatic feed of material from the hopper to the mincing neck, the minimum height of the machine and its easy cleaning are guarantees of a first-class product. When coupling two mincers in series it is possible to achieve the finest grain-size from big pieces of meat inserted into the first machine. The automatic transport of rough chopped meat from one mincer into the other is enabled by an extension on the inclined neck of the mincer. The operation of both machines is synchronized by adjusting the speed of the feed worms.

The type 122a Cutter, intended above all for small workshops, is designed for cutting and mixing meat. It may also be applied advantageously for mixing and whisking various mayonnaises, pastes and fruit purées. The cutter bowl has a capacity of 45 litres and the cutter shaft has two speed steps - 1170 and 2340 r.p.m. Its smooth surface contributes to the smart appearance of the machine and enables its easy cleaning.

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The cutting machine is provided with a protective light alloy cover to safeguard the attending personnel from possible accidents. The machine can be set into operation only with the protective cover in working position. The fitting of the cutter shaft on special bearings guarantees the durability and smooth run of the machine.

The type 131 Disintegrator is intended for disintegrating finely minced meat, cooked leather and other raw materials of a similar character. The range of its application is very wide as this machine may be used for the manufacture of various sorts of pastes, meat spreads, fruit mélanges and jellies, fish pastes, etc. The equipment operates continually and may be arranged in a production line; it may, however, be applied quite independently. The quality of the disintegrating effect is adjustable by means of a control wheel located on the front part of the machine. Its output of 2000 kg/hr. is a sufficient indicator of the quality of the machine.

The Automatic Mixing Machine is manufactured in two designs. The smaller one, the type 147, is provided with a mixing bowl of a capacity of 50 litres, whereas the bigger one, the type 143, has a mixing bowl of a capacity of 250 litres. Both types are suitable for mixing previously prepared chopped meat with an admixture of bacon or meat extract cubes as well as all sorts of salads. During operation the mixing vessel is enclosed by a transparent lid which enables observing of the mixing process and, at the same time, serves as a protection against accidents. The special arrangement of the mixing worms and the diagonal guarantees perfect mixing and prevents smearing of the treated material. The mixer is emptied automatically by opening the side lid while the machine is in operation.

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The type 157 Vacuum Sausage Filling Machine is constructed for application of the new principle of filling all sorts of sausages. The machine is provided with an exhaust equipment which frees the chopped meat of the wisked-in air before filling. The main advantage of this method of treatment is apparent when cutting solid products, which are more compact and free of air bubbles. Thus the production of sausages of greater durability and better quality is enabled. The output of the equipment depends on the size of the filling pipe and ranges as high as 2000 kg/hr. In view of its continual operation the vacuum filler may be put into a production line.

The type 201 Sausage Slicing Machine is intended for slicing sausages, delicacies, vegetables and fruit in thin slices. The inclined arrangement of the table facilitates simple fixing of the sliced material. The cut slices pile up in such a manner that they are immediately ready for wrapping. The thickness of the slices can be adjusted by means of a hand disc according to the requirements of customers.

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Czechoslovak Motor Cycles Lead Throughout the World

In these days of revolutionary progress, we do not speak in superlatives unless their use is fully warranted. We would certainly not have worded our heading as it is printed above if it were not a clear and true statement of fact, for such a favourable opinion on Czechoslovak motor cycles, especially if used in a heading, must be borne out by evidence.

For such evidence, let us first consult data of such gravity as world motor cycle sales statistics which prove that Jawa-ČZ motor cycles are at present the world's best selling make. Tens of thousands of these machines are to be seen on the roads of any of 130 countries and the demand is continually growing. In Czechoslovakia itself, twowheelers of all capacities, including scooters, are enjoying great popularity. According to somewhat incomplete statistics, 88,000 machines were sold last year on the home market of this relatively small country and, during the current year, no fewer than 103,000 will be available to home purchasers.

Such trade results could naturally not be achieved without corresponding qualities of the product. And judging by the reputation these machines have made for themselves both in sporting events and in everyday operation, their qualities must deserve full marks.

Consider the results of last years International Six Days' Trial - the toughest event for motor cycles the world has known: In 1958 the venue was Garmisch-Partenkirchen. Czechoslovakia entered twenty riders on Jawa-ČZ machines and all of them finished unpenalized to gain gold medals. Both in the individual

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classification and team contests these men took all there was to be taken, thus proving once more that Jawa-ČZ motor cycles lead the world.

Similar results are being achieved by Czechoslovak motor cycles in other important events. To quote an example, Jaromír Čížek became the European Scrambles Champion on a Jawa-ČZ machine in 1958 and in this year's championship series, both leading places in the championship are held by Czechoslovak riders /at the time of writing/ and final victory seems well within their reach.

It goes without saying that gruelling events of this type provide the best means of comparing the capabilities of various makes and that the eyes of the whole sporting public are upon the winners. To gain the lead and to maintain it over a number of years is a difficult task indeed. It is still more difficult to pass the trials of everyday service at the foot of great mountain ranges, under conditions of extreme heat or Siberian cold, or in the sandy atmosphere of the Sahara Desert.

As Czechoslovak Jawa-ČZ motor cycles are sold to the four corners of the earth, they naturally undergo more extensive endurance trials than any other make under the critical eyes of the public. The results obtained during this everyday usage do the greatest credit to the Czechoslovak designers and manufacturers of these machines. To find the reasons behind such success let us take a closer look at one of these machines, for instance the most popular machine of the day, the 250 Jawa-ČZ.

The pleasing outline of the machine suggests at first sight

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that this is a vehicle of exceptional quality. A further look reveals a shapely engine-gearbox unit which affords protection to all the more sensitive engine parts. No motor cycle enthusiast can resist the temptation of starting the engine. Not only is the sure manner of bringing the engine to life a surprise, but once on the move, the flexibility of the engine is a revelation. Machine control is extremely easy. The kickstarter swings forward to become a regular positive-stop foot change gear lever. The clutch withdrawal mechanism, which by the way is patented throughout the world, calls for hand lever operation only while moving off. It is fully automatic during the engagement of any ratio once the machine is under way.

Other advantages of the machine become apparent to the observer when the machine is travelling at full speed. A ride over any distance is sheer pleasure owing to the excellent suspension by long-travel telescopic front fork and pivoted rear fork. The deeply valanced mudguards and shrouded engine permit the rider to mount his Jawa-ČZ machine without fuss, even in his Sunday suit, if he just happens to be wearing it, without the risk of having it soiled by road dirt or mud.

It takes only a few minutes' riding for a discerning rider to discover these advantages which are then never forgotten. This is also part of the explanation of the great popularity of these motor cycles all over the world.

At present, Czechoslovakia produces these machines in the classic range of capacities of 125, 175, 250 and 350 c.c. The 125, 175 and 250 c.c. models employ single-cylinder two-stroke engines, the

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350 model is a parallel-twin two-stroke. All these models have been received with quite exceptional enthusiasm by the motor cycling public throughout the world. This popularity, together with the trade and sports results and the performance in everyday usage, provide ample reasons for claiming that these machines really lead throughout the world.

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Goods TRANSPORT of To-day

What is required of it ? Economy, speed and reliability. These are the very features inherent to the ŠKODA 706 RT truck designed for speedy transport of heavy cargoes. Economic in operation, reliable in performance and of sturdy build, this type possesses a number of improvements as compared with the previous ones: lighter control, smaller wheels, lower weight. The comfortable driver's cabin is fully enclosed and heated with hot air in cold weather. Three persons of the crew can be seated behind the driver's seat. Panoramic windscreen and wrap-around side windows ensure a perfect vision to the driver.

The engine is a water cooled, four stroke, direct injection six cylinder diesel of 160 HP output at 1900 RPM. Swept volume 11,781 c.c. or 718.641 cu.in., fuel consumption at full load 25 litres per 100 km or 11.28 miles per Imp. gallon. Maximum speed 75 km or 46.6 m.p.h.; maximum payload 7 metric tons or 15,432 lbs.

Last but not least let us point out yet another feature: the vehicle is of C z e c h o s l o v a k make, bearing the world-renowned ŠKODA trade mark which speaks for itself, spelling

a b s o l u t e r e l i a b i l i t y .

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Motor Sprinkler - for Hygiene

Two types of these important assistants of hygiene both in municipal and rural areas have been manufactured before. Now the new ŠKODA AKV 706 RT universal motor sprinkler blends most happily the features of both the municipal and the road model. It will prove useful for sprinkling streets and roads, for washing roadways, spraying buildings, in farming as well as for fire extinguishing and sanitation purposes. The tank of 7000 litres or 1540 Imp.galls. capacity in conjunction with the pump, sprinkling set and controls forms a unit carried in resilient mountings on the ŠKODA 706 RT trambus chassis. For sprinkling serve controllable sprinkling units attached to the sides of the vehicle and a spray nozzle arranged underneath its tail, while an adjustable washing bar attached to the rear of the vehicle serves for washing and spraying purposes. The sprinkling units and washing bar are controlled from the operator's seat arranged on the rear part of the water tank above the pump. Maximum sprinkling width is 15 metres or 49 ft, washing width 2 1/2 metres or 8.2 ft. Both the sprinkling and the washing width can be clearly seen and readily controlled from the operator's seat. The pumping set can deliver 1000 litres or 220 Imp.gallons water per minute. Thus, more than one kilometre or .621 mile of roadway of 15 metres or 49 ft width can be sprinkled within seven minutes.

These are some essential data regarding the special purpose ŠKODA AKV 706 RT universal motor sprinkler. Last but not least, let us point out its exceptional reliability and working economy. It is a product of the Czechoslovak industry bearing the world renowned ŠKODA trade mark.

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Motor Vehicles in Czechoslovak Machinery Production

Although motor transport showed a rising trend in Czechoslovakia prior to World War II and several highly successful types of vehicles - passenger as well as lorries - were produced, the quality of the products, with some exception, was not above average.

In this respect it may be said that a fundamental change occured after the Second World War. Immediately after the War, Czechoslovak designers, engineers and workmen developed a number of highly progressive designs of motor cycles, passenger cars and commercial vehicles of all kinds and, furthermore, they started mass producing them. The introduction of mass production methods was made possible by the concentration of the automotive industry into a small number of big production plants which are known under the names of Škoda, Praga, Tatra and Jawa-ČZ. The growing demand on home and foreign markets has acted as a mighty stimulus upon the rate of increase in production.

Thus, for example, in comparison with the per capita output for 1937, motor cycle and scooter production has risen almost tenfold. Czechoslovakia now leads the world in the number of motor cycles produced. Series of tens of thousands of Jawa-ČZ motor cycles, which today are despatched to 130 countries, have helped to place Czechoslovakia among the foremost exporters of these vehicles in the world.

The situation of Czechoslovakia as an exporter of motor cars is somewhat more difficult, especially owing to the great demand of home buyers, for whom we even have to import various cars of foreign manufacture. Notwithstanding this, more than 25,000 passenger cars have been sold abroad by Czechoslovakia in 1958. The production of commercial vehicles is also steadily increasing. A great number of highly modern commercial vehicles of 3 to 12 ton capacity has been produced in addition to special purpose vehicles. All these vehicles are noted for their progressive design and exceptional standard of manufacture. These fine characteristic features of the vehicles are a most effective recommendation and as a result, exports of Czechoslovak commercial vehicles show a steadily increasing trend. In the case of commercial vehicles

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rising exports have also greatly affected production which is now more than six times as large as in 1953.

Such figures are hardly surprising if we bear in mind the unprecedented rate of expansion of the Czechoslovak engineering industry during recent years. Motor vehicle production is an important part of the activities of this industry, the output of which has risen by approximately 14 per cent compared with 1957. If the total production of 1948 is taken as a basis for comparison, then we arrive at the remarkable figure of a 375 per cent increase.

In the post-war era, the Czechoslovak engineering industry has undergone a process of consolidation and regrouping into several great manufacturing plants according to the type of machinery produced. The export of these products has been organized in a similar manner and is, therefore, handled by the various foreign trade corporations. The past ten years have proved the wisdom of this arrangement which has produced the best results. The Motokov Corporation is thus the sole exporter of products of the automobile and tractor industries to the whole world.

1959 is the year of the first International Trade Fair at Brno - a trade show which is carrying on the good tradition of the former Prague Sample Fairs. It is beyond doubt that the occasion will, above all, turn out to be a grand first showing of recent products of the Czechoslovak engineering industry and the place of honour will be taken by automotive products. All the new models of Czechoslovak motor-cycles, scooters, cars, goods vehicles and tractors are bound, on this occasion, to uphold their fine reputation on export markets, which has placed Czechoslovakia in recent years among the most successful exporting countries in the world.

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Czechoslovak Scooters - Machines for the Well Dressed Rider

Czechoslovak JAWA-ČZ motor cycles are renowned for their performance and handling, which have brought them victory in the most arduous trials throughout the world. Besides these well known qualities, there is one which has received much less publicity : Owing to the fully enclosed engine and shrouded moving parts as well as deeply balanced mudguards, the machines may be ridden in ordinary town clothing without fear of soiling it.

It was only natural for designers who had shown so much consideration for the needs of the owners of Czechoslovak motor cycles to apply all their experience in matters of this kind in the design of the two new scooter types, the Czechoslovak ČZ and Manet scooters. Owing to the proximity of the capacity classes of the 175 c.c. ČZ and the 100 c.c. Manet and also owing to their equally fine roadholding and performance, both these machines are great mutual competitors. Thus the measure of riding comfort provided and the degree to which the machine is equipped become the decisive features considered when making the choice among these two rivals.

The ČZ scooter is well known to the motoring public, being a model which over a period of three years has gained and maintained its place, despite keen competition, on international markets owing to its elegant styling and great comfort.

The 100 c.c. Manet, second of the scooters from Czechoslovakia, has now been in production for one year. For a brief introduction to the machine, here is its specification :

The engine of 100 c.c. swept volume is a single-cylinder two-stroke, the machine will carry two and maintain a speed of about 75 km p.h. /47 m.p.h./ with the fuel consumption not exceeding 2.5 litres per 100 kilometres, i.e. 113 m.p.g. /Imp./. The machine certainly does credit to its designers and manufacturers. The Manet is a scooter which owes nothing to models currently produced, but which nevertheless maintains all the advantages of the modern scooter, such as, for example, the fully enclosed engine.

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Being a "big" machine in its own way, the Manet boasts flashing direction indicators, which as a matter of interest, were not permitted on single-track vehicles until recently in Czechoslovakia. Another novelty of this machine is the neatly laid out handlebar windscreen with its patented draughtproof lower sliding joint with the frontal fairing. It goes without saying that an electric starter is fitted and that the riding position is extremely comfortable and the control of the machine as a whole very easy. The beautiful styling of the machine provides a fitting outline to a scooter of outstanding merit.

The current year thus marks the introduction of the second successful small capacity scooter to foreign markets. The home and foreign public has been quick to recognize the advantages of this model and to create a great demand. Eloquent evidence of this is provided by the sold-out stock and by the production rate which is daily increasing.

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that this is a vehicle of exceptional quality. A further look reveals a shapely engine-gearbox unit which affords protection to all the more sensitive engine parts. No motor cycle enthusiast can resist the temptation of starting the engine. Not only is the sure manner of bringing the engine to life a surprise, but once on the move, the flexibility of the engine is a revelation. Machine control is extremely easy. The kickstarter swings forward to become a regular positive-stop foot change gear lever. The clutch withdrawal mechanism, which by the way is patented throughout the world, calls for hand lever operation only while moving off. It is fully automatic during the engagement of any ratio once the machine is under way.

Other advantages of the machine become apparent to the observer when the machine is travelling at full speed. A ride over any distance is sheer pleasure owing to the excellent suspension by long-travel telescopic front fork and pivoted rear fork. The deeply valanced mudguards and shrouded engine permit the rider to mount his Jawa-ČZ machine without fuss, even in his Sunday suit, if he just happens to be wearing it, without the risk of having it soiled by road dirt or mud.

It takes only a few minutes' riding for a discerning rider to discover these advantages which are then never forgotten. This is also part of the explanation of the great popularity of these motor cycles all over the world.

At present, Czechoslovakia produces these machines in the classic range of capacities of 125, 175, 250 and 350 c.c. The 125, 175 and 250 c.c. models employ single-cylinder two-stroke engines, the

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350 model is a parallel-twin two-stroke. All these models have been received with quite exceptional enthusiasm by the motor cycling public throughout the world. This popularity, together with the trade and sports results and the performance in everyday usage, provide ample reasons for claiming that these machines really lead throughout the world.

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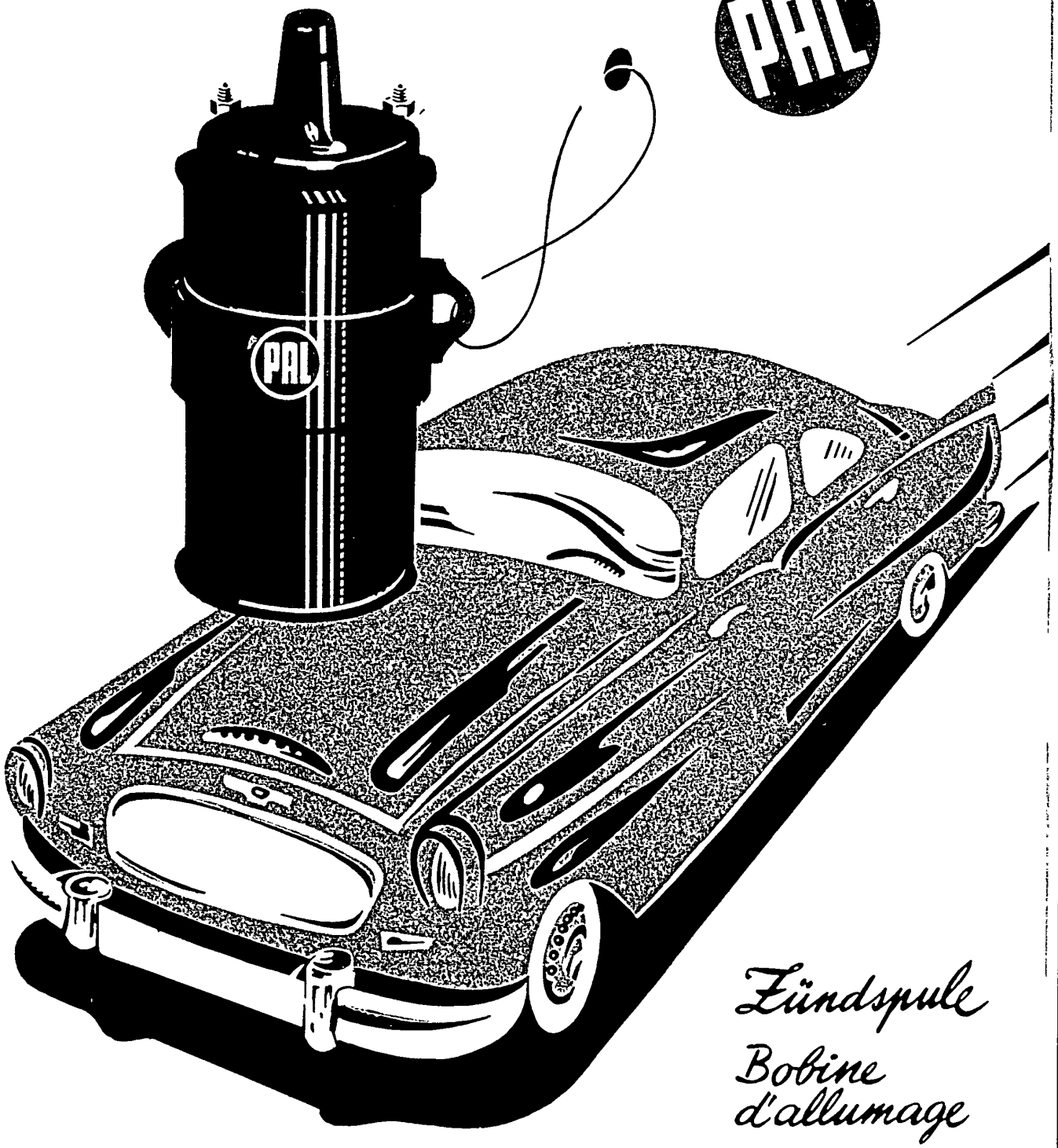
PAL



Zündspule

Bobine d'allumage

Ignition coil

Bobina de encendido

MOTOKOV

PRAHA-CZECHOSLOVAKIA

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WE TAKE THE LIBERTY OF OFFERING YOU THE FOLLOWING ARTICLES FROM OUR RICH EXPORT-PROGRAM:
NOUS NOUS PERMETTONS DE VOUS OFFRIR LES ARTICLES SUIVANTS DE NOTRE RICHE PROGRAMME D'EXPORTATION:
AUS REICHEM EXPORT (PROGRAMME) BIETEN WIR AN:

Motorcycle Headlamps Ø 150 mm with Lighting Switches adapted for Speedometer.
Electric Horns 6–12–24 V.
Headlamps Ø 170 mm.
Inspection Lamps 6–12 V, Length of Cable 7–10 metres.
Headlamps Ø 170 mm flush fitted.
Trafficators 6–12–24 V, Arm length 165–200–225 mm.
Fog Lamps Ø 125 mm, glass yellow or white.
Oscillating Trafficators 6–12–24 V, Arm length 275 mm.
Light Switches.
Tell-Tale Lamps with Control Glass White, Red, Violet, Blue, Yellow or Green.
Foot Operated Dip Switches under or above the floor.
Cigar Lighters 6–12 V.
Trafficator Switches.
Ignition Coils 6–12 V.
Stop Light Switches.
Electric Oil Pressure Gauges. Thread M 10X1.
Ignition Distributors for 4–6–8-cyl.-engine.
Spark Plugs and Heater Plugs, Thread M 14 and M 18.
Heater Plug Starting Switches.
Heat Controllers.
Magnetic Starting Change Over Switches 12/24 V.
Speedometers Type Tatra Ø 130 mm.
Speedometers Type Škoda Ø 100 mm.
Switch Boxes with Switch Position 0–1–2 and 0–1–2–3 for 6–12–24 V Ø 26,5 mm.
Speedometers for Motorcycles and Trucks, Ø 80 and 80 mm.
Fuse Boxes 4–6 or 8 Poles.
Telethermometers for Water or Oil, Ø 60 mm. Length of Capillary Tube 1300 mm or 1500 mm, or as ordered.
Fuel Gauges with Float Ø 60 mm.
Driving Mirrors.
Ammeters Ø 60 mm.
Dome Lamps Ø 90 mm.
Oil and Pressure Gauges Ø 60 mm.
Dome lamps Ø 140 mm bus model.
Speedometer Flexible Drive Shafts, length as ordered.
Windscreen Wipers 6–12–24 V.
Valves for Motorcars, Motorcycles and Bicycles.
Batteries 6 V 60–75–90–105–150 Ah.
Tyre Pumps Ø 35 and 40 mm.
Batteries 12 V 45–60–75–105–150 Ah.
Tyre Pressure Gauges 3, 6, 8, 12 Atmospheres.
Carburettors for Motorcycles.
Stop and Tail Lamps round and oval.
Steering Wheels – as ordered.

Phares pour motocyclettes Ø 150 mm avec interrupteur et orifice pour tachymètre.
Avertisseurs électriques 6–12–24 V.
Phares Ø 170 mm.
Lampes portatives 6–12 V, longueur de câble 7–10 mètres.
Optiques de phare Ø 170 mm.
Indicateurs de direction 6–12–24 V, longueur de bras 165–200–225 mm.
Phares anti-brouillard Ø 125 mm, couleur de verre jaune ou verre pur.
Indicateurs de direction wig-wag 6–12–24 V avec étui extérieur 275 mm.
Prises de courant.
Lampes-témoin avec verre de contrôle blanc, rouge, jaune, vert, bleu et violet.
Commutateurs code au pied à fixer sur le plancher et sous le plancher.
Allumeurs de cigares 6–12 V.
Commutateurs de flèches.
Bobines d'allumage 6–12 V.
Interrupteurs Stop.
Mano-contacts pression d'huile, écrou M 10X1.
Distributeurs d'allumage pour 4–6–8 cylindres.
Bougies d'allumage et bougies de réchauffement, écrou M 14 et M 18.
Conjoncteurs de chauffage.
Lampes-témoin de bougie de préchauffage.
Commutateurs de batterie 12–24 V.
Indicateurs de vitesse type Tatra Ø 130 mm.
Indicateurs de vitesse type Škoda Ø 100 mm.
Commutateurs à clé – positions 0–1–2 et 0–1–2–3 pour 6–12–24 V Ø 26,5 mm.
Tachymètres pour motocyclettes et automobiles Ø 60 et 80 mm.
Boîtes à fusibles 4–6–8 polaires.
Thermomètres pour l'eau et pour l'huile, Ø 60 mm, longueur de tube capillaire 1300 mm et 1500 mm, ou selon commande.
Indicateurs de niveau d'essence et flotteurs, Ø 60 mm.
Rétroviseurs.
Ampèremètres Ø 60 mm.
Plafonniers Ø 90 mm.
Indicateurs de pression d'huile Ø 60 mm.
Plafonniers Ø 140 mm pour autobus.
Arbres flexibles de commande de l'indicateur de vitesse – longueur selon désir.
Essuie-glace 6–12–24 V.
Auto-moto-vélo-valves.
Batteries 6 V 60–75–90–105–150 Ah.
Pompes à air Ø 35 et 40 mm.
Batteries 12 V 45–60–75–105–150 Ah.
Manomètres à air 3, 6, 8 et 12 atm.
Carburateurs pour motocyclettes.
Lanternes Stop rondes et ovales.
Volants de direction – selon désir.

Motorrad-Scheinwerfer Ø 150 mm mit Lichtschaltern und für Tachometer-Einbau.
Hörner 6–12–24 V.
Scheinwerfer Ø 170 mm.
Handleuchten 6–12 V, Kabellänge 7–10 Meter.
Scheinwerfer-Einsätze Ø 170 mm.
Winker 6–12–24 V, Armlänge 165–200–225 mm.
Nebelscheinwerfer Ø 125 mm, Glasfarbe: gelb oder klar.
Pendelwinker 6–12–24 V, Armlänge 275 mm.
Schubschalter.
Kontroll-Lampen: weiss, rot, violett, blau, gelb und grün.
Fuss-Abblendschalter für Bodenbefestigung und versenkte Befestigung.
Zigarrenanzünder 6–12 V.
Winkerschalter.
Zündspulen 6–12 V.
Bremslichtschalter.
Öldruck-Kontakte, Gewinde M 10X1.
Zündverteiler für 4–6–8 Zylinder-Motoren.
Zündkerzen und Glühkerzen, Gewinde M 14 und M 18.
Glüh-Anlasschalter.
Glüh-Überwacher.
Anlassumschalter 12/24 V.
Tachometer Type Tatra Ø 130 mm.
Tachometer Type Škoda Ø 100 mm.
Schaltkasten mit Schaltstellungen 0–1–2 und 0–1–2–3 für 6–12–24 V Ø 26,5 mm.
Tachometer für Motorräder u. Kraftwagen, Ø 60 und 80 mm.
Sicherungsdosen mit 4–6–8 Sicherungen.
Fernthermometer für Wasser u. Öl, Ø 60 mm.
Kapillarenlänge 1300 mm und 1500 m oder nach Wunsch.
Elektrische Kraftstoffmesser und Schwimmer, Ø 60 mm.
Rückblickspiegel.
Amperemeter Ø 60 mm.
Deckenleuchten Ø 90 mm.
Öl- und Luftdruckmesser Ø 60 mm.
Deckenleuchten Ø 140 mm für Autobus.
Biegsame Antriebswellen – Länge nach Wunsch.
Scheibenwischer 6–12–24 V.
Auto-Moto-Velo-Ventile.
Batterien 6 V 60–75–90–105–150 Ah.
Handluftpumpen Ø 35 und 40 mm.
Batterien 12 V 45–60–75–105–150 Ah.
Pneu-Luftdruckmesser 3, 6, 8, 12 Atm.
Vergaser für Motorräder.
Brems-Schlussleuchten rund und oval.
Lenkräder – je nach Wunsch.

MOTOKOV

PRAHA-CZECHOSLOVAKIA

856/MO - 5706-1PRA

Printed in Czechoslovakia

PAL SPARKING PLUGS ARE AMONG THE BEST IN THE WORLD
- BOUGIES QUI COMPTENT PARMI LES MEILLEURES DU MONDE
- KERZEN GEHÖREN ZU DEN BESTEN AUF DER WELT

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Dome Lamps ø 90 mm.
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Indicateurs de niveau d'essence et flotteurs, ø 60 mm.
Rétroviseurs.
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Indicateurs de pression d'huile ø 60 mm.
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Nebelscheinwerfer ø 125 mm, Glasfarbe: gelb oder klar.
Pendelwinker 6—12—24 V, Armlänge 275 mm.
Schubschalter.
Kontroll-Lampen: weiß, rot, violett, blau, gelb und grün.
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Pneu-Luftdruckmesser 3, 6, 8, 12 Atm.
Vergaser für Motorräder.
Brems-Schlußleuchten rund und oval.
Lenkräder—je nach Wunsch.

MOTOKOV

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An den zahlreichen sportlichen Erfolgen der tschechoslowakischen Motorräder und Kraftwagen hat auch die tschechoslowakische Kraftwagen- und Motorradausrüstung PAL bedeutsamen Anteil. Ohne diese tadellos und verlässlich funktionierenden Geräte gäbe es keine Siege, gäbe es weder verlässlichen Betrieb noch Fahrsicherheit und Wirtschaftlichkeit des Kraftstoffverbrauches, durch den gerade die tschechoslowakischen Kraftfahrzeuge rühmlich bekannt sind.

Die PAL-Ausrüstung umfasst Geräte jeder Art. In erster Linie ist es die elektrische Ausrüstung der Kraftfahrzeuge, ferner Lichtmaschinen, Anlasser, Zündverteiler, Zündspulen, Schalter, Relais, Winker, Scheinwerfer, Scheibenwischer, Hupen, Bremsschlussleuchten usw., die in verschiedenen Grössen und Ausführungen hergestellt werden, so dass sowohl der Bedarf des kleinsten Motorrades als auch der des grossen Lastkraftwagens oder Schleppers vollkommen gedeckt werden kann.

Eine andere grosse Gruppe bildet die mechanische Ausrüstung, wie Einspritzpumpen und sonstiges Zubehör für Dieselmotoren einerseits und Vergaser, Filter und Pumpen für Benzinmotoren anderseits. Hierher gehören auch hydraulische Hochleistungsbremsen, hydraulische Hebel- und Teleskopdämpfer, Steuerräder u. ä. Auch auf diesem Gebiete erreichen PAL-Erzeugnisse eine Vollkommenheit, die selbst den strengsten Anforderungen Genüge leistet.

Nicht minder grosse Aufmerksamkeit wird der Erzeugung von präzisen und verlässlichen Schaltbrettgeräten gewidmet. Ob Geschwindigkeitsmesser, Wärmemesser, Druckmesser, Ölstandanzeiger, Benzinstandanzeiger usw., alle zeichnen sich durch Genauigkeit und Verlässlichkeit aus.

Jedes Gerät, das die Bezeichnung PAL trägt, ist ein Qualitätserzeugnis.

Les nombreux succès enregistrés dans diverses compétitions sportives par les motocyclettes et automobiles tchécoslovaques sont dus en grande partie à l'équipement pour motocyclettes et automobiles tchécoslovaque PAL. Sans cet équipement de fonctionnement parfait, la sûreté en service, la marche impeccable et l'économie de combustible, qui caractérisent si bien les voitures de fabrication tchécoslovaque, n'auraient jamais été réalisées.

L'équipement PAL comprend des appareils de toutes sortes, en premier lieu l'installation électrique des véhicules, à savoir dynamos, démarreurs, distributeurs, bobines d'induction, conjoncteurs, relais, indicateurs de direction, phares, essuie-glace, avertisseurs, lampes-stop, etc. Tous ces articles son fabriqués en différentes grandeurs et présentations et conviennent par conséquent aussi bien aux petites motocyclettes qu'aux grands camions et tracteurs.

Un autre groupe important est constitué par l'équipement mécanique, d'une part par les pompes d'injection et autres accessoires pour moteurs Diesel et, d'autre part, les carburateurs, filtres et pompes pour moteurs à essence. Dans ce groupe se rangent également les freins hydrauliques de grande puissance, les amortisseurs hydrauliques à levier et télescopiques, les volants de direction etc. Aussi dans ce domaine, les articles de la marque PAL atteignent un haut niveau de perfection et répondent parfaitement aux exigences les plus sévères.

Une attention non moins grande est vouée à la fabrication d'instruments et appareils de bord: qu'il s'agisse de compteurs kilométriques, thermomètres, baromètres, jauges à huile ou à essence, tous ces articles se distinguent par une précision absolue et un fonctionnement impeccable.

Bref, la marque PAL est toujours le garant d'une haute qualité et d'une sûreté parfaite.

PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL PAL

Czechoslovak automobile and motorcycle PAL equipment plays an important part in the success of Czechoslovak motorcycles and automobiles in numerous sporting events. Without the faultless and relliable functioning of Czechoslovak automobile and motorcycle PAL equipment there would be no victories, no reliable service, safe driving and economical use of fuel by which Czechoslovak automobiles and motorcycles are world-famous.

PAL equipment includes all sorts of instruments. These are mostly electrical installation on cars and motorcycles: dynamos, starters, distributors, induction coils, switches, relays, trafficators, head-lamps, screen wipers, horns, stop-lights, etc., produced in various sizes and designs so as to completely cover the requirements of small motorcycles as well as of large trucks or tractors.

Mechanical equipment is another large group — injection pumps and accessories for Diesel motors and carburettors, filters and pumps for gasoline motors, powerful hydraulic brakes, hydraulic shock absorbers — standard and telescopic, steering wheels, etc. Even in this field PAL products have proved to be perfect and complied with the most exacting demands.

The same attention is given to the production of precise and reliable dashboard instruments. Tachometers, thermometers, barometers, oil pressure gauges, etc. — these all excel in their accuracy and reliability.

Every instrument bearing the trade mark PAL, is a product of high quality.

PAL

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PRAHA-CZECHOSLOVAKIA

PAL

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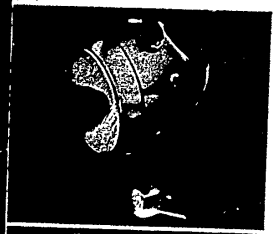
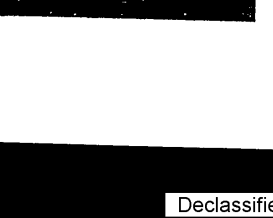


Motorrad-Scheinwerfer Ø 150 mm. mit Lichtschaltern und für Tachometer-Einbau.
Motorcycle Headlamps Ø 150 mm with Lighting Switches adapted for Speedometer.
Phares pour motocyclette Ø 150 mm avec interrupteur et orifice pour tachymètre.

Hörner 6—12—24 V.
Electric Horns 6—12—24 V.
Avertisseurs électriques 6—12—24 V.

Scheinwerfer Ø 170 mm.
Headlamps Ø 170 mm.
Phares 170 mm.

Handleuchten, Kabellänge 4—5—7 Meter.
Inspection Lamps, Lenght of Cable 4—5—7 metres.
Lampes portatives, longueur de câble 4—5—7 mètres.

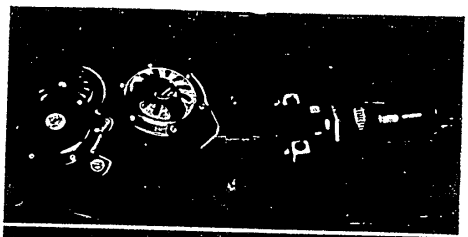


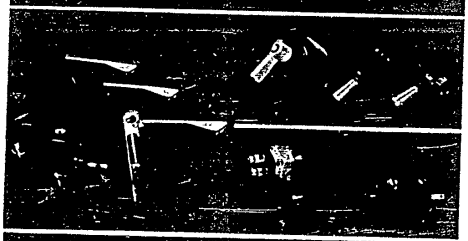
Scheinwerfer-Einsätze Ø 170 mm.
Headlamps Ø 170 mm flush fitted.
Optiques de phare Ø 170 mm.

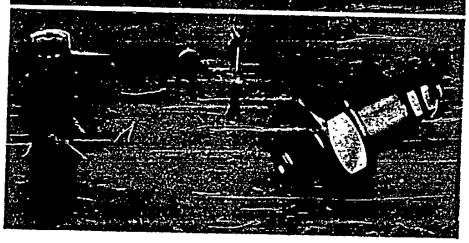
Winker 6—12—24 V, Armlänge 165—200—225 mm.
Trafficators 6—12—24 V, Arm length 165—200—225 mm.
Indicateurs de direction 6—12—24 V, longueur de bras 165—200—225 mm

Nebelscheinwerfer Ø 125 mm, Glasfarbe: gelb oder klar.
Fog Lamps Ø 125 mm, glass yellow or white.
Phares anti-brouillard Ø 125 mm, couleur de verre jaune ou verre pur.

Pendelwinker 6—12—24 V, Armlänge 275 mm.
Oscillating Trafficators 6—12—24 V, Arm Length 275 mm.
Indicateurs de direction wig-wag 6—12—24 V avec étui extérieur 275 mm.







Schubschalter.
Light Switches.
Prises de courant.

Kontroll-Lampen: weiss, rot, violet, blau, gelb oder grün.
Tell-Tale Lamps with Control Glass White, Red, Violet, Blue, Yellow or Green.
Lampes-témoin avec verre de contrôle blanc, rouge, jaune, vert, bleu ou violet.

Fuss-Abblendschalter für Bodenbefestigung und versenkte Befestigung.
Foot Operated Dip Switches under or above the floor.
Commutateurs au pied code à fixer sur le plancher et sous le plancher.

Zigarrenanzünder 6—12 V.
Cigar Lighters 6—12 V.
Allumeurs de cigares 6—12 V.

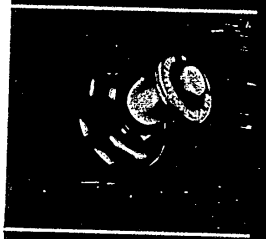
Winkelschalter.
Trafficator Switches.
Commutateurs de flèches.

Zündspulen 6—12 V.
Ignition Coils 6—12 V.
Bobines d'allumage 6—12 V.

Bremslichtschalter.
Stop Light Switches.
Interrupteurs Stop.

Öldruck-Kontakte, Gewinde M 10x1.
Electric Oil Pressure Gauges. Thread M 10x1
Mano-contacts pression d'huile, écrou M 10x1.

Zündverteiler für 4 6 8 Zylinder-Motoren.
Ignition Distributors for 4 6 8-cyl.-engine.
Distributeurs d'allumage pour 4 6—8 cylindres.



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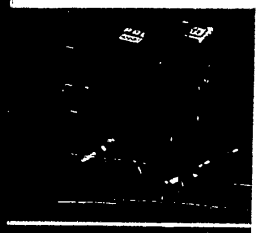
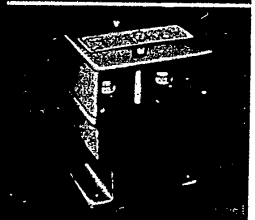
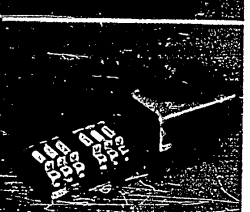


Zündkerzen und Glühkerzen, Gewinde M 14 und M 18.
Spark Plugs and Heater Plugs, Thread M 14 and M 18.
Bougies d'allumage et bougies de réchauffement, écrou M 14 et M 18.

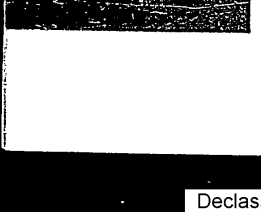


Glüh-Anlassschalter.
Glüh-Überwacher.
Heater Plug Starting Switches.
Heat Controllers.
Conjoncteurs de chauffage.
Lampes-témoin de bougie de préchauffage.

Anlassumschalter 12/24 V.
Magnetic Starting Change Over Switches 12/24 V.
Commutateurs de batterie 12—24 V.



Tachometer Type Tatra Ø 130 mm.
Tachometer Type Skoda Ø 100 mm.
Speedometers Type Tatra Ø 130 mm.
Speedometers Type Skoda Ø 100 mm.
Indicateurs de vitesse type Tatra Ø 130 mm.
Indicateurs de vitesse type Skoda Ø 100 mm.

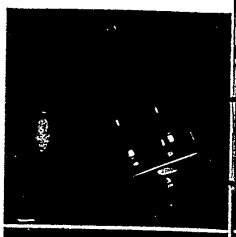


Schaltkasten mit Schaltstellungen 0—1—2 und 0—1—2—3 für 6—12—24 V Ø 26,5 mm.
Switch Boxes with Switch Position 0—1—2 and 0—1—2—3 for 6—12—24 V Ø 26.5 mm.
Commutateurs à clé — positions 0—1—2 et 0—1—2—3 pour 6—12—24 V Ø 26,5 mm.

Tachometer für Motorräder u. Kraftwagen, Ø 60 und 80 mm.
Speedometers for Motorcycles and Trucks, Ø 60 and 80 mm.
Tachymètres pour motocyclettes et automobiles Ø 60 et 80 mm.

Sicherungsdosen mit 4—6—8 Sicherungen.
Fuse Boxes 4—6 or 8 Poles.
Boîtes à fusibles 4—6—8 polaires.

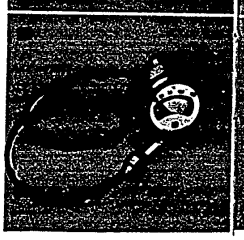
Fernthermometer für Wasser u. Öl, Ø 60 mm.
Kapillarenlänge 1300 mm und 1500 mm oder nach Wunsch.
Telethermometers for Water or Oil, Ø 60 mm. Length of Capillary Tube 1300 mm or 1500 mm, or as ordered.
Thermomètres pour l'eau et pour l'huile, Ø 60 mm, longueur de tube capillaire 1300 mm et 1500 mm, ou selon commande.



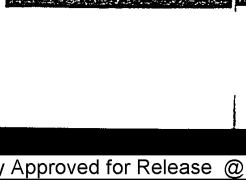
Elektrische Kraftstoffmesser mit Schwimmer, Ø 60 mm.
Fuel Gauges with Float Ø 60 mm.
Indicateurs de niveau d'essence et flotteurs, Ø 60 mm.

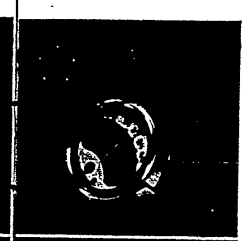
Amperemeter Ø 60 mm.
Ammeters Ø 60 mm.
Ampèremètres Ø 60 mm.

Öl- und Luftdruckmesser Ø 60 mm
Oil and Pressure Gauges Ø 60 mm.
Indicateurs de pression d'huile Ø 60 mm.

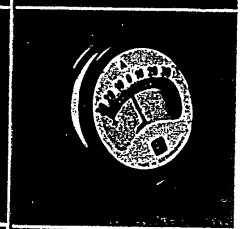


Biegsame Antriebswellen — Länge nach Wunsch.
Speedometer Flexible Drive Shafts, length as ordered.
Arbres flexibles de commande de l'indicateur de vitesse — longueur selon désir.

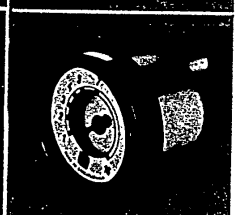




Rückblickspiegel:
Driving Mirrors.
Rétroviseurs.

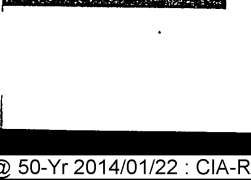


Deckenleuchten Ø 90 mm.
Dome Lamps Ø 90 mm.
Plafonniers Ø 90 mm.



Deckenleuchten Ø 140 mm für Autobus.
Dome Lamps Ø 140 mm bus model.
Plafonniers Ø 140 mm pour autobus.

Scheibenwischer 6—12—24 V.
Windscreen Wipers 6—12—24 V.
Essuie-glace 6 - 12 - 24 V.



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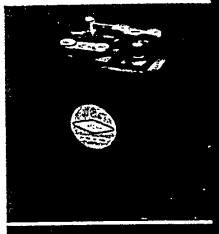
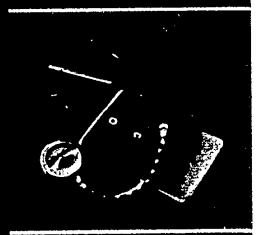
Auto-Moto-Ventile.
Valves for Motorcars, Motorcycles and Bicycles.
Auto-moto-vélo-valves.



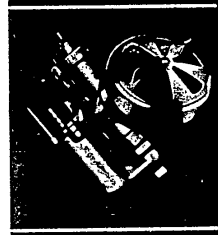
Batterien 6 V
60—75—90—105—150 Ah.
Batteries 6 V
60—75—90—105—150 Ah.
Batteries 6 V
60—75—90—105—150 Ah.

Handluftpumpen Ø 35 und 40 mm.
Tyre pumps Ø 35 and 40 mm
Pompes à air Ø 35 et 40 mm.

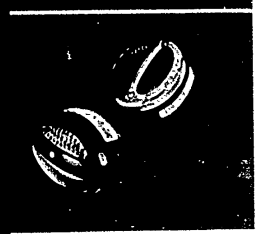
Batterien 12 V
45—60—75—105—150 Ah.
Batteries 12 V
45—60—75—105—150 Ah.
Batteries 12 V
45—60—75—105—150 Ah.



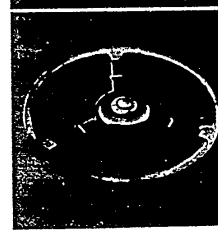
Pneu-Luftdruckmesser 3, 6, 12 Atm.
Tyre Pressure Gauges 3, 6, 12 Atmospheres.
Manomètres à air 3, 6 et 12 atm.



Vergaser für Motorräder.
Carburettors for Motorcycles.
Carburateurs pour motocyclettes.



Brems-Schlussleuchten
rund und oval.
Stop and Tail Lamps
round and oval.
Lanternes Stop rondes
et ovales.



Lenkräder — je nach Wunsch.
Steering wheels — as ordered.
Volants de direction — selon désir.

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Printed in Czechoslovakia

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CATALOGUE

OF

PAL

MOTORCAR & MOTORCYCLE

EQUIPMENT

Edition 1958

MOTOKOV

PRAHA—CZECHOSLOVAKIA

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Czechoslovak automobile and motorcycle PAL equipment plays an important part in the success of Czechoslovak motorcycles and automobiles in numerous sporting events. Without the faultless and reliable functioning of Czechoslovak automobile and motorcycle PAL equipment there would be no victories, no reliable service, safe driving and economical use of fuel by which Czechoslovak automobiles and motorcycles are world-famous.

PAL equipment includes all sorts of instruments. These are mostly electrical installation on cars and motorcycles: dynamos, starters distributors, induction coils, switches, relays, trafficators, head-lamps, screen wipers, horns, stop-lights, etc., produced in various sizes and designs so as to completely cover the requirements of small motorcycles as well as of large trucks or tractors. Mechanical equipment is another large group – injection pumps and accessories for Diesel motors and carburettors, filters and pumps for gasoline motors, powerful hydraulic brakes, hydraulic shock absorbers – standard and telescopic, steering wheels, etc. Even in this field PAL products have proved to be perfect and complied with the most exacting demands.

The same attention is given to the production of precise and reliable dashboard instruments. Tachometers, thermometers, barometers, oil pressure gauges, etc. – these all excel in their accurary and reliability.

Every instrument bearing the trade mark PAL, is a product of high quality.

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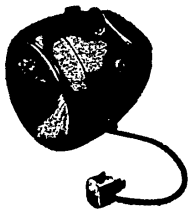
Item. No.	Ordering Reference	DESCRIPTION
		 **MOTORCYCLE HEADLAMPS**
1a	RMT 150	Lens opening 150 mm (5 7, 8″). Equiped with switch box with switchpositions 0—1—2 and Anti-Dazzle-Switch for mounting on the handle bar dia 21 to 26 mm. Distance between fixing nuts (M8×12) of 180 mm Speedometer opening dia 80 mm. Black housing, chromium plated rim. Main bulb (two filament) socket BA 20 d, Auxiliary bulb socket BA 9s. Head lamps are supplied without bulbs and without tell-tale lamps. Aprox. weight: 1.25 kg.
		MOTORCAR HEADLAMPS
2a	8-9302-15K	Lens opening dia 170 mm, ball-type base, hollow base bolt with M 18 × 1,5 thread. Main bulb (two filament) socket BA 20d, Auxiliary bulb socket BA9s. Supplied without bulbs. Finish: Housing black, Chromium-plated rim. Aprox. weight: 1.40 kg.
2b	8-9302.16	According to the description No. 2a. Finish: Housing black, rim black.

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Item. No.	Ordering Reference	DESCRIPTION
		MOTORCAR HEADLAMPS
3	8-9303.21	Built-in type. Lens opening 170 mm (6 11/16"). Chromium plated rim. Main bulb (two filament) socket BA 20d, Auxiliary bulb socket BA 9s. Supplied without bulbs. Aprox. weight: 1.10 kg.
		FOG LAMPS
4a	A 010 L	Lens opening 125 mm, ball-type base, hollow base with M 12 thread, max. width of the housing (incl. glass) 110 mm. Bulb socket BA 20. Supplied without bulbs. Finish: black housing, chromium-plated rim, clear or yellow glass. Aprox. weight: 0.70 kg.
4b	A 010 C	According to the description No. 4a. Finish: All chromium-plated yellow glass.

Item. No.	Ordering Reference	DESCRIPTION
		5a—b. **SIGNAL HORNS FOR MOTORCYCLES — FLAT TYPE** 5c—e **SIGNAL HORNS FOR MOTORCARS — FLAT TYPE**
5a	1-9414.01 (left inferior)	Max. dia 105 mm. Max. height with one-hole hoalder 125 mm. Fixing hole dia 8 mm. Finish: chromium-plated cover, black housing. Voltage: 6 Volts. Aprox. weight: 0.50 kg.
5b	1-9414.00	According to the description No. 5a. Finish: all black enamelled.
5c	1-9415.00	Dia 133 mm. Max. height with one-hole (⌀ 10,5 mm) hoalder 170 mm. Finish: all black enamelled. Voltage: 6 Volts. Aprox. weight: 0,90 kg.
5d	1-9416.03	According to the description No. 5c. Voltage: 12 Volts.
5e	1-9417.00	According to the description No. 5c. Voltage: 24 Volts.
		ELECTROMAGNETIC HANDLAMPS
6	A 107/7m	With 7 m cable incl. plug and socket. Voltage: 6, 12, 24 V. For 1 bulb socket BA 15 s. Supplied without bulbs. Aprox. weight: 0.35 kg.

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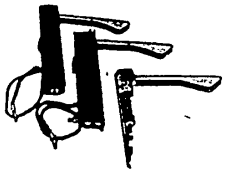
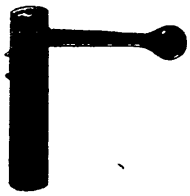
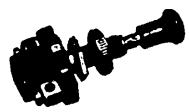
Item. No.	Ordering Reference	DESCRIPTION
		**TRAFFICATORS WITH CASING FOR EXTERNAL MOUNTING**
7a	1-9410.11 (1st on the left)	Arm length: 165 mm. Total length: 42 mm, Width 22 mm, Height: 222 mm. Voltage: 6 Volts. Aprox. weight: 0.95 kg/one pair.
7b	1-9411.11	According to the description No. 7a. Voltage: 12 Volts.
7c	1-9410.21	Arm length: 200 mm. Total length: 42 mm, Width: 22 mm, Height: 257 mm. Voltage: 6 Volts. Aprox. weight: 1.06 kg/one pair.
7d	1-9411.21	According to the description No. 7c. Voltage: 12 Volts.
7e	1-9410.49	Arm length: 225 mm. Total length: 50 mm, Width 22 mm, Height: 282 mm. Voltage: 6 Volts. Aprox. weight: 1.50 kg/one pair.
7f	1-9411.49	According to the description No. 7e. Voltage: 12 Volts.
7g	1-9412.49	According to the description No. 7e. Voltage: 24 Volts.

Remarks to the descriptions No. 7a to 7g:
Trafficators are supplied with cable (450 mm), packed in boxes of one pair. Finish:
Black housing.

Item. No.	Ordering Reference	DESCRIPTION
		**OSCILLATING TRAFFICATORS FOR EXTERNAL MOUNTING**
8a	1-9410.90	Arm length: 275 mm. Total Length: 81 mm, Width: 39 mm, Height: 380 mm. Finish: Housing in ivory colour. Supplied with fixing brackets but without cable. Voltage: 6 Volts. Aprox. weight: 3.95 kg (one pair).
8b	1-9411.90	According to the description No. 8a. Voltage: 12 Volts.
8c	1-9412.90	According to the description No. 8a. Voltage: 24 Volts.
		**PULL — PUSH SWITCHES**
9a	TV VDA	Moulded in bakelite. Mounting board thickness 1 to 17 mm. Mounting opening dia 8 mm. Max. height under the board 25 mm. Total height: 60 mm. Heavy duty type. Aprox. weight: 0.03 kg.
9b	9-9430.40 (Sim. to fig. 9 but without back housing)	According to the description No. 9a. Knob in ivory colour. Mounting board thickness 1 to 2 mm. Dia of mounting: 10.5 + 0.2 mm. Aprox. weight: 0.014 kg.

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Item. No.	Ordering Reference	DESCRIPTION
		ANTI-DAZZLE SWITCHES FOR MOTOR VEHICLES
10a	20-9431.06 (left)	Heavy duty built-in type, moulded in bakelite. Mounting opening dia 29.6 mm. Max. height above the floor 58 mm. Fixing plate dimensions:. 36×94 mm. Two fixing holes 6.4 mm, fixing holes centres 66 mm. Aprox. weight: 0.12 kg.
10b	9-9431.00 (right)	For mounting on the floor provided with two fixing holes dia 5.2 mm, fixing holes centres 38 mm. Max. height 60.5 mm, max dia of the base 55.5 mm. Finish: black enamelled. Aprox. weight: 0.11 kg.
		11a CONTROL SWITCHES FOR DIRECTION INDICATOR 11b—c DIRECTION INDICATOR SWITCHES
11a	20-9433.12 (left)	Flush-mounted, moulded in bakelite with polystyrene operating handle in ivory colour. Mounting opening dia 26 mm. Total height: 60 mm, height under the floor 32 mm. Max. dia of the housing 42 mm For 1 bulb socket E 10 13. Supplied without bulbs. Aprox weight: 0.08 kg
11b	20-9432.05 (middle)	According to the description No. 11a Mounting opening dia 12.5×11.3 mm. Mounting board thickness 1 to 2 mm. Length of the lever· 30 mm Dimensions of the housing: 40×22×34 mm. Without control bulb Aprox. weight: 0.035 kg.
11c	8E17 (right)	Not delivered

Item. No.	Ordering Reference	DESCRIPTION
		12a HYDRAULIC STOP LIGHT SWITCHES 12b STOP LIGHT SWITCHES — MECHANICAL TYPE W. SPRING
12a	20-9434.51 (left)	Threading M 10×1 mm (cone 1 : 16). Max. height 40 mm. Contacting pressure 4.5 to 9 Atm (kg cm2). Finish: metal made. Aprox. weight: 0.03 kg.
12b	20-9434.02 (right)	Dimensions of the housing: 33×34×29 mm. Provided with 2 fixing holes dia 4.5 mm. Fixing holes centres 24 mm Max. length with spring: 100 mm. Finish: moulded in bakelite Aprox. weight: 0.029 kg.
		ELECTRIC OIL PRESSURE SWITCHES
13	20-9434.07	Threading M 10 × 1 (cone 1 . 16). Total length 44 mm. Length of the threading: 9 mm. Desired contacting pressure between 1.5 and 4 Atm can be adjusted by means of a M 3 screw. Contact voltage: 6—12—24 Volts. Finish: metal made Aprox weight· 0.04 kg.
		TELL — TALE LAMPS
14	20-9345.08	White cover with 7 mm dia of lense in red, blue, green or reddish-yellow colour Mounting opening dia 20.5 mm Mounting board thickness 1 to 2 mm. Max height above the board 8 mm, under the board 34 mm Max. dia 28 mm For 1 bulb 6, 12 or 24 Volts, socket BA 9s. Supplied without bulbs. Finish· moulded in bakelite Aprox. weight 0.012 kg

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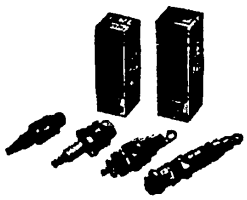
Item. No.	Ordering Reference	DESCRIPTION
		CIGAR LIGHTERS
15b	1-9427.00	Mounting opening dia 27 mm, mounting board thickness 1 to 15 mm. Total length 62 mm, height under the board 35 mm Heating period max. 5 sec. after pushing the button. Finish: white or black operating knob. Voltage: 6 Volts. Aprox. weight: 0.06 kg
15a	1-9427.01	According to the description No. 15a. Voltage: 12 Volts.
		IGNITION COILS FOR MOTORCARS
16a	2-9211.01	Housing dia 69 mm. Max. height 153 mm. Provided with fix mounting clips. Distance between two 9X10 mm fixing holes 72 mm. Max. number of sparks 6 mm lang: 14.000/min. Finish: light blue colour. Voltage 6 V. Aprox. weight: 0,94 kg.
16b	2-9215.01	According to the description 16a. Voltage 12 V.

Item. No.	Ordering Reference	DESCRIPTION
		IGNITION DISTRIBUTORS
17a	2-9204.00	For 4-stroke engines. Mounting with collar bearing. Automatic control 20°. High-tension cable outlet is axially Length of the shaft 25,4 mm, dia 12 h 6 mm. Supplied with condensor and timing lever. Max. 2500 R. P. M. Finish: Housing in khaki (light blue) colour, cap of bakelite. Rotation as viewed from the front: clockwise. Aprox. weight: 0.81 kg.
17b	2-9204.91	According to the description No. 17a. Rotation as viewed from the front: anti-clockwise.
		18a—l **SPARK PLUGS** 18m—n **HEATER PLUGS**
18a	14/95 (1st from the left)	Thread M 14 × 1 25. Length of the thread: 12 mm. Total length: 63 mm. Aprox. weight: 0.05 kg. Similar to: AC-USA 49; Auto-Lite A-11; Bosch W 95 T 1; Champion-US: J-1, N-1, N-2; KLG-GB : F-20.
18b	14/125	According to the description No. 18a. For motor's temperature of 125° C.
18c	14/145	According to the description No. 18a. Similar to: AC-USA: AF, 47-Com; Auto-Lite AL-7; Bosh W 145 T 1 and W 145 T 7; Champion-US : C; KLG-GB : F-50, FL-50.
18d	14/175	According to the description No. 18a. Similar to: AC-USA: 45-L; Auto-Lite AL-4 and AL-5; Bosch W 175 T 1; Champion-USA H-10.

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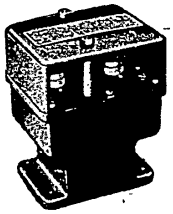
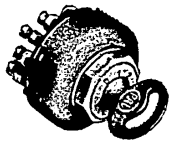
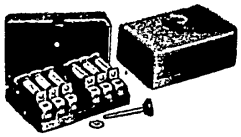
Item. No.	Ordering Reference	DESCRIPTION
18e	14/195	According to the description No. 18a. For motor's temperature of 195° C.
18f	14/225	According to the description No. 18a. Similar to AC-USA: 44-L, Bosch W 225 T 1 and 2; Champion-USA: H-8 and H-10; KLG-GB F-70.
18g	18/95 (2nd from the left)	Threading: M 18 × 1.5. Length of the threading 12,5 mm Total length: 68 mm. Aprox. weight: 0.09 kg. Similar to: AC-USA: 2, 85, 86; Auto-Lite B-9; Bosch M 95 T 1; Champion-USA: 11, 12, 15 and C-15; KLG-GB M-30 and TM-30.
18h	18/125	According to the description No. 18g. For motor's temperature value of 125° C.
18i	18/145	According to the description No. 18g. Similar to: AC-USA: 83, 84, D-6 and D-7; Auto-Lite B-5 and B-7; Bosch M 145 T 1; Champion-USA 13, 18, B-2 and B-3; KLG-GB: M-50, S/T/M-50.
18j	18/175	According to the description No. 18g. Similar to: AC-USA 81, 82, C-3 and O-6; Auto-Lite BT-4; Bosch M 175 T 1; Champion-USA: 16, 17, H-16 and H-17(A); KLG-GB: M-60, M-80.
18k	18/195	According to the description No. 18g. For motor's temperature value of 195° C.
18l	18/225	According to the description No. 18g. Similar to: AC-USA: G-1, G-2 and O-4; Auto-Lite B-3; Bosch M 225 T 1.
18m	18 T 1 (3rd from the left)	Thread M 18 × 1.5. Rated voltage 1.7 Volts. Spanner opening 26 mm (1 1/32"). Similar to Bosch KE/GA 2/1. Old Bosch No. GS 2 D 30. Aprox. weight: 0.10 kg.
18n	18 T 2 (4th from the left)	According to the description 18m. Spanner opening 19 mm Similar to Bosch KE-GA 2/5 (replacing GS 2 D 9). Aprox. weight: 0.12 kg.

Item. No.	Ordering Reference	DESCRIPTION
		**MAGNETIC — STYLE STARTING CHANGE-OVER SWITCHES 12/24 V**
19	2-9443.02	For temporarily series-connection by starting 12, 24 Volts. Operating in connection with heater plug starting switch 2-9433.00 (sea fig. 22 pos. 22a), for systems with heater plugs or with push button switch 20-9430.13 (sea pos. 101). Similar to Bosch: SH/SE 8/6. Finish: light blue. Aprox. Weight: 2.30 kg.
		**SWITCH AND LIGHTNING BOXES**
20a	2-9440.31	Flush mounted. Mounting opening dia 26.5 mm (7.5 × 33.5 mm). Mounting board thickness max. 2 mm. Supplied with 2 keys. Finish: Zinc-plated housing, chromium-plated nut. Swich positions: 0–1–2 Aprox weight. 0.13 kg.
20b	2-9440.42	According to the description No. 20a. Switch positions: 0—1—2—3.
		21a FUSE BOXES FOR 2 STONE FUSES 21b FUSE BOXES FOR 4 STONE FUSES 21c FUSE BOXES FOR 6 STONE FUSES 21d FUSE BOXES FOR 8 STONE FUSES
21a	20-9450.02	Moulded in bakelite, for stone fuses 6 × 25 mm Dimensions of the housing: 50 × 40 × 37 mm. Base plate provided with two 5.5 mm dia holes for fixing screws. Distance between holes 25 mm. Aprox. weight· 0.06 kg.

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Item. No.	Ordering Reference	DESCRIPTION
21b	20-9454-.00	According to the description No. 21a. Dimensions of the housing: 55×50×37 mm. Distance between two (⌀5.5 mm) holes: 40 mm. Aprox. weight: 0.08 kg.
21c	20-9456.02	According to the description No. 21a. Dimensions of the housing: 75×50×37 mm. Distance between two (⌀ 5.5 mm) holes: 60 mm Aprox. weight: 0.10 kg.
21d	09-9450.08	According to the description No. 21a. Dimensions of the housing 98×50×39 mm. Distance between two (⌀ 5.5 mm) holes: 57 mm Aprox. weight: 0.12 kg.

22a **HEATER PLUG STARTING SWITCHES**

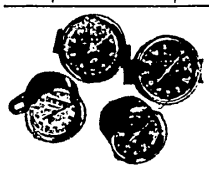
22b **HEATER CONTROLLERS**

22a	2-9433.00 (left)	Flush mounted. Mounting opening dia 26.6 mm. Mounting board thickness 1 to 2 mm. Housing dia 70.5 mm. Max. height under the board 75 mm. Finish: light blue cover, operating handle of zinc. Aprox. weight: 0.48 kg.
22b	1-9549.22 (right)	Flush mounted. Mountig opening dia 27 mm. Mounting board thickness 1 to 2 mm. Length 63 mm, width 30 mm, height under the floor 67 mm, total height incl. screws 83 mm. Finish: zinc-plated. Aprox. weight: 0.135 kg.

Item. No.	Ordering Reference	DESCRIPTION

SPEEDOMETERS FOR MOTORCARS

23a	RE602-11-0.45 (left)	Mounting opening dia 130 mm, flush type for front-side mounting with fastening strap. For two illuminating bulbs (socket BA 9s). Supplied without bulbs. Finish: black housing, chromium-plated rim. Transparent dial 0-160 km. Gear ratio 0.45. Aprox. weight: 0.70 kg.
23b	RE602-12-0.72	According to the description No. 23a. Transparent dial 0-100 miles. Gear ratio 0.72.
23c	RC955-0.3-1.0 (right)	Mounting opening dia 100 mm. Flush type for front-side mounting by fastening strap. Incorporated tell-tale lamps in blue, red, reddish-yellow and green colour. For 2 illum. bulbs (socket BA 9s). Supplied without bulbs. Finish: grey housing, chromium-plated rim. Transparent plastic dial 0–140 km. Gear ratio 1.0. Aprox. weight: 0.53 kg.
23d	RC955-0.4-1.6	According to the description 23 c. Transparent plastic dial 0—100 miles Gear ratio 1.6.



SPEEDOMETERS FOR MOTORCARS AND MOTORCYCLES

24a	RA100-20-1.0	Built-in type for front-side mounting in the motorcycle head lamps or in the vehicle dashboards by means of a U-bolt. Provided with five figure counter. Max. height of all the types: 93 mm (3.66″). Finish: black housing, chromium plated rim. Mounting opening dia 60 mm. Dial 0-100 km. Gear ratio 1.0. Aprox. weight: 0.40 kg.
24b	RA80-29-1.6	According to the description No. 24a. Dial 0—80 miles. Gear ratio 1.6.
24c	RB100-24-1.0	According to the description 24a. Mounting opening dia 80 m (3.15″). Dial 0—100 km black with white figures. Gear ratio 1.0. Aprox weight: 0.50 kg.

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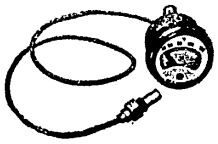
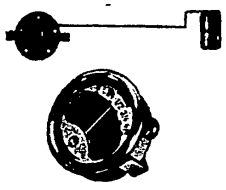
Item. No.	Ordering Reference	DESCRIPTION
		Remarks: (for fig. 23 and 24) 1. Flexible driving shafts with a squared end (2.5 mm) are to be fastened by means of a M 18 × 1.5 tubing nut to the speedometers. Supplied without driving shafts, which are to be ordered separately (See fig. No. 29). 2. To find the respective reduction (gear ratio number), please count the revolutions of the small pinion shaft at the gear box while driving 10 meters (32.8 ft.). For example: If the small pinion shaft turns 4.5 times, the reduction is 0.45, if turns 10 times, the reduction is 1.00 etc.
		Remarks: (for fig. 24) **When ordering please state:** a) desired colour of the dial. Supplied in white colour with black figures or in black colour with white figures. b) Required "Gear ratio" (See § No. 2). c) Whether the speedometers are to be used for mounting on the top of the motorcycle front fork by a hoalder or to be built in.



TELETHERMOMETERS

25a	T60/09-0.4-1500	Mounting opening dia 60 mm (2.36"). Mounting from behind. Max. height 80 mm (3.15"). Flat glass dial 40 to 120° C. Length of the Capillary tube: 1.500 mm. Union bolt for the block assembly provided with M 14 × 1.5 thread. Indirectly illuminated by a bulb (socket BA 9s), mounted on the back side of the housing. Finish. all black enamelled. Supplied without bulbs. Aprox. weight: 0.33 kg.
25b	T955-0.2-1300	According to the description No. 25a. For mounting in the dashboard from in front. Transparent scale with figures in relief. Dished glass. Scale range 40—120° C. Capillary tube 1300 mm Finish: Light grey housing, chromium-plated rim. Supplied without bulbs. Aprox. weight: 0.36 kg.

Item. No.	Ordering Reference	DESCRIPTION



26a **ELECTRIC FUEL GAUGES 12 VOLTS**

26b-g **FUEL GAUGE FLOAT DEVICE**

26a	B6087-04.12 (fig. inf.)	Mounting opening dia 60 mm, mounted from in front. Max. height 62 mm. Flat dial printed on glass. Indirectly illuminated (bulb socket BA 9s). Supplied without bulbs. Finish: enamelled housing, chromium-plated rim. N. B. Only with Fuel Gauge Float Device PAL (Fig. 26b-g). Aprox. weight: 0.15 kg.
26b	BPS 06-270 (fig sup.)	For mounting with five M 5 bolts on the flange of the gasoline tank. Length of the float arm 270 mm. Voltage: 6 V. Aprox. weight: 0.21 kg.
26c	BP 12-270	According to the description No. 26b. Voltage: 12 Volts.
26d	BP 12-282	According to the description No. 26c. Float arm: 282 mm.
26e	BP 12-288	According to the description No. 26c. Float arm: 288 mm
26f	BP 12-300	According to the description No. 26c. Float arm: 300 mm
26g	BP 24-282	According to the description No. 26d. Voltage: 24 Volts.

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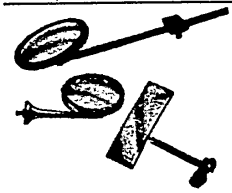
Item. No.	Ordering Reference	DESCRIPTION
		AMMETERS
27	A 60.01.30	Mounting opening dia 60 mm (2.36″). Mounted in the dashboard from behind. Dial 30 ± 30 Amp. printed on flat glass. Without self-illumination. Max. height: 50 mm. Finish: All black enamelled. Aprox. weight: 0.12 kg.
		OIL PRESSURE GAUGES
28	M 60-16.01	Mounting opening dia 60 mm (2.36″). For mounting from behind. Max. height 80 mm (3.15″). Connection of the pipe (with conical end) by means of a tubing nut M 12 × 1,5. Indirect illuminated. Dial up to 16 kg/cm² printed on a flat glass. Finish: all black enamelled. Aprox. weight: 0.25 kg.
		SPEEDOMETER FLEXIBLE DRIVE SHAFTS
29		Various length. Connections similar to "OK" Types b...L, b...D and b...H (... = desired length). When ordering please state required length, connection and sens of rotation.

Item. No.	Ordering Reference	DESCRIPTION
		30a **REAR VIEW MIRRORS OR TRUCKS AND BUSSES** 30b **REAR VIEW MIRRORS FOR ONE-HOLE FIXING** 30c-d **REAR VIEW MIRRORS FOR MOTORCARS**
30a	L 5051 (top)	For external mounting. Dished glass dia 130 mm. Length of the support arm 300 mm. Provided with a ball-joint and shifting base (for fixing) with four 4 mm dia holes. Finish: all black enamelled. Aprox. weight: 0.43 kg.
30b	L 5058 (middle)	On front wing of the motorcar. Dshed glass 100 mm dia. 135 mm long support arm with threading and nut, attached to the mirror by means of a ball-joint. Finish: All chromium-plated. Aprox. weight: 0.23 kg.
30c	A 160 (right inf.)	For internal. mounting. Panoramic glass: 140×45 mm, back side moulded in bakelite of ivory colour. 115 mm long support arm connected with the mirror by means of a ball joint. Bipartite curved bracket provided with two 4 mm dia holes. Fixing holes centres: 45 mm. Aprox. weight: 0.16 kg.
30d	120-94520 (not illustr.)	For internal mounting. Elips-shaped with sides vertically cut. Dimensions of the mirror: 135 × 70 mm. Double bent support arm with ball joints on both ends. Fixing base provided with two 4 mm dia holes. Fixing holes centres 34 mm. Finish: polished aluminium. Aprox. weight: 0.15 kg.
		DOME LAMPS FOR MOTORCARS
31	A 124	Lens opening dia 68 mm. For surface mounting. Incorporated switch. Max. dia 105 mm. Max. height: 30 mm. For 1 bulb (socket) suffit 39 × 11 mm. Supplied without bulbs. Finish: all chromium-plated. Aprox. weight: 0.13 kg.

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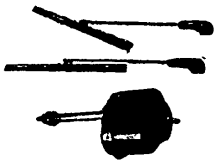
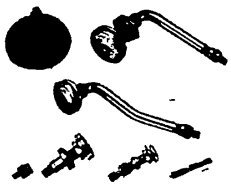
Item. No.	Ordering Reference	DESCRIPTION
		DOME LAMPS FOR BUSSES
32	A 127	1/2 flush mounted. Opal glass dia 140 mm. Max. dia 160 mm. Max. height 52 mm. For two bulbs socket BA 15s. Supplied without bulbs. Finish: silver colour rim. Aprox. weight: 0.30 kg.
		33a–c **WINDSCREEN WIPER MOTORS** 33d-e **WIPER ARMS AND BLADES**
33a	9-9423.08 (sim. fig. inf.)	With incorporated switch. Dimensions of the housing: 90 × 60 × 81 mm. Wiping angle 115°. Shaft for wiper arm dia 5mm. Finish: black enamelled housing. Threading: 85 mm. Voltage: 6 Volts, Aprox. weight: 0.80 kg. Wiper arms are to be ordered separately (items 33b—c)).
33b	9-9423.14	According tot he description No. 33a. Threading: 100 mm. Voltage 12 Volts.
33c	9-9423.13	According to the description No. 33a. Threading: 85 mm. Voltage: 24 Volts.
33d	9-9429.32 (top)	Single type. Finish: black enamelled. Arm length: 236 mm. Blade length: 225 mm Aprox. weight: 0.07 kg.
33e	9-9429.34	According to the description No. 33 d. Finish: chromium-plated. Length of the arm 236 mm. Length of the blade: 250 mm. Aprox. weight: 0.08 kg.

Item. No.	Ordering Reference	DESCRIPTION
		34a **RUBBER COVERED VALVES** 34b **SINGLE BENT VALVES FOR MOTORCARS** 34c-d **DOUBLE BENT VALVES FOR MOTOR CARS** 34f-g **VALVE CAPS FOR MOTORCYCLE AND MOTORCAR VALVES** 34h-i **CYCLE VALVES** 34j-m **VALVE CORES FOR MOTORCAR AND MOTORCYCLE VALVES**
34a	52521 (top left)	Max. height without valve cap.: 37 mm. Dia of the round-shaped base: 53 mm. Finish: compl. with valve cores and valve cap. Aprox. weight: 0.026 kg.
34b	563 (top right)	Length: 30 × 105 mm. Angle: 100°. Finish: brass, nickel-plated. Aprox. weight: 0.10 kg.
34c	544 (middle)	Angles 90 and 30°. Finish: brass, nickel-plated. Dimensions. 32 × 73 × 38 mm. Aprox. weight: 0.092 kg.
34d	545	According to the description No. 34c. Dimensions: 32×85×38 mm. Aprox. weight: 0.10 kg.
34f	65 (bottom, 1st from the left)	Finish: brass, nickel-plated. Packed in paper boxes of 5 pcs. Aprox. weight of 100 boxes· 1.55 kg.
34g	51	According to the description 34f, but without boxes. Aprox. weight of 100 pcs: 0.30 kg.
34h	310 (bottom, 3rd from the left)	Without cap-chain and bridge washer. Length of the body (without cap)· 31 mm. Finish: brass, nickel-plated. Aprox. weight: 0.016 kg.
34i	321 (sim. to the item No. 34h)	According to the description No. 34h, without chain, but with bridge washer. Aprox. weight: 0.0181 kg.
34j	406 (bottom, 1st from the right)	Finish: brass. Packed in paper boxes of 5 pcs Aprox. weight: 0.65 kg/100 boxes.
34k	410	According to the description 34j, but without paper boxes. Aprox. weight: 0.12 kg/100 pcs.
34m	430	According to description 34k but short type. Aprox. weight: 0.10 kg/100 pcs.

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Item. No.	Ordering Reference	DESCRIPTION
		HAND OPERATED TYRE PUMPS
35a	RH 35	Barell dia 35 mm, length 500 mm. Woven hose 800 mm long equiped with simple straight or Lock Tite Air Chuck. One-step base. Wooden red enamelled handle. Finish: Various colours. Aprox. weight: 1.05 kg.
35b	RH 40	According to the description No. 35a. Barell dia 40 mm. Aprox. weight: 1.15 kg.
35c	RH 40 T	According to the description 35a. Barell dia 40 mm, length 600 mm. Woven hos 1000 mm long. Aprox. weight: 1.46 kg.
		36a, b, d **TYRE PRESSURE GAUGES FOR MOTORCARS AND MOTORCYCLES** 36c, e **TYRE PRESSURE GAUGES FOR TRUCKS**
36a	3,2 Atm (top)	Measuring scale up to 3,2 Atm (= kg/cm²). Closed length 110 mm. Supplied with leather cover. Finish: nickel-plated. Aprox. weight: 0.06 kg.
36b	6 Atm.	According to the description No. 36a. Measuring scale up to 6 Atmospheres. Closed length 120 mm.
36c	8 Atm. 100 Lbs/in² (not illustr.)	Dial type with deflating pin and woven hose. Double-Dial range in Atm as well as in lbs/in². Up to 8 Atmospheres equal 100 lbs/in². Supplied with plastic cover. Finish: polished. Aprox. weight: 0.10 kg (without cover) 0.12 kg (with cover)

Item. No.	Ordering Reference	DESCRIPTION
36d	3 Atm 40 Lbs/in² (not illustr.)	According to he description No. 36c, but with short curved inflating tube. Double-dial in Atm as well as in lbs/in². Dial range up to 3 Atm equal 40 lbs/in². Aprox. weight: 0.10 kg (without cover) 0.12 kg (with cover)
36e	8 Atm 100 Lbs/in² (not illustr.)	According to the description No. 36c but with long double-ended tube 340 mm long. Supplied in wooden boxes. Finish: nickel-plated. Aprox. weight: 0.62 kg (with wooden box).
		COMBINED STOP AND TAIL LAMPS
37a	St-1 (top)	Round-shaped type dia 80 mm. Provided with red and orange glass. Clear glass at the bottom illuminates the number plate. Fixing bracket with two 6 mm dia holes for fixing screws. For two Strip Light Bulbs 39 × 11 mm. Supplied without bulbs. Finish: black housing, chromiumplated rim. Aprox. weight: 0.25 kg.
37b and 37c		Not delivered.
37d	St-2 (sim. fig. lefts inf.)	Egg-shaped type. One-piece red and orange glass moulded in the form of the rim. Provided with a clear glass for illumination of the number plate. Fixing with two M 6 × 1 bolts. For - bulb socket BA 15s and 1 Strip Light Bulb 39 × 11 mm. Supplied without bulbs. Finish: black enamelled housing. Aprox. weight: 0.31 kg.
37e	8-9342.34 (not illustr.)	Oval-shaped type 100 × 77 × 50 mm. One-piece red glass of plastic with prismatic center. Provided with a clear glass for illumination of the number plate. Fixing with two M 6 bolts. For 2 bulbs with socket BA 15s and 1 Strip Light bulb 39 × 11 mm. Supplied without bulbs. Finish: black enamelled housing, chromium-plated rim. Aprox. weight: 0.21 kg.

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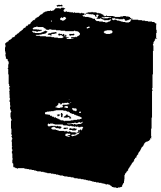
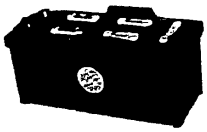


BATTERIES FOR MOTORCARS, TRUCKS AND BUSSES — 6 VOLT

	Type	Capacity Amp. hrs.	Plate Number	Length × Width × Height	Charge rate Amp.	Aprox. weight kg
38a	3E4	60	9	200 × 180 × 240 mm	6	15.45
38b	3E5	75	11	235 × 180 × 240 mm	8	19.93
38c	3E6	90	13	270 × 180 × 240 mm	9	21.90
38d	3E7	105	15	305 × 180 × 240 mm	11	26.—
38e	3E10	150	21	415 × 180 × 250 mm	15	35.53



BATTERIES FOR MOTORCARS, TRUCKS AND BUSSES — 12 VOLT

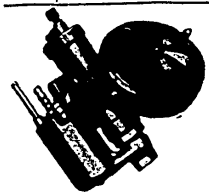
	Type	Capacity Amp. hrs.	Plate Number	Length × Width × Height	Charge rate Amp.	Aprox. weight kg
39a	6E3	45	7	315 × 180 × 240 mm	5	24.91
39b	6E4	60	9	375 × 180 × 240 mm	6	31.56
39c	6E5	75	11	440 × 180 × 240 mm	8	38.—
39d	6E7	105	15	515 × 225 × 240 mm	11	51.—
39t	6E10	150	21	525 × 295 × 250 mm	15	71.16

Remarks to figure No. 38 and 39.

The capacity in Ah to be understood at 10 hours discharging giving the battery 10% higher capacity then at a 20 hour period Charging period: 13 hours.

When ordering please state:

Required capacity in Ah at 10 or 20 hours discharging rate Plate number is not decisive because the plates of our batteries ar thicker and therefore the plate numbre lower.

Item. No.	Ordering Reference	DESCRIPTION
		
40a-g 40h		**MOTORCYCLE CARBURETTORS CARBURETTORS FOR SCOOTERS AND MOPEDS**
40	2924 H	For 250 to 350 ccm engines. Intake dia 24 mm. Single throttle valve type. Small, left, separable float chamber with big ticker, fed by a gummy-hose from the top. Inlet fuel muffler's inner dia 28,6 H 8 mm. Dia of the flange for air cleaner fixing: 35 H 9 mm. Supplied with cross shaped air cleaner dia 80 mm, provided with a rotary shutter. Max. dimensions: 148 × 99 × 150 mm. Finish: special polished zinc-plated surface. Aprox. weight incl. air. cleaner 0,98 kg.
40b	2914 H (not illustr.)	For 100 ccm engines. Intake dia 14 mm. Single throttle valve type. Small, left, not separable float chamber fed by a gummy-hose from the top. Inlet fuel muffler's inner dia 23 H 8 mm. Outer dia of the flange for air cleaner fixing: 20 H 12 mm. Supplied with straight air cleaner dia 70 mm, provided with a rotary shutter. Max. dimensions: 90 × 88 × 120 mm. Finish: Special polished zinc-plated surface. Aprox. weight incl. air. cleaner 0,50 kg.
40c	2916 (not illustr.)	For 100 to 125 ccm engines. Intake dia 16 mm. Single throttle valve type. Small, left, separable float chamber, fed by a fuel pipe with cap nut from the top. Inlet fuel muffler's inner dia: 23 H 8 mm. Outer dia of the flange for air cleaner fixing: 20 H 12 mm. Supplied with straight air cleaner dia 70 mm, provided with a rotary shutter. Max. dimensions with air cleaner: 90×88×120 mm. Finish: Special zinc-plated polished surface. Aprox. weight incl. air. cleaner 0,50 kg.
40d	2918 HN (not illustr.)	For 125 to 150 ccm engines. Intake dia 18 mm. Single throttle valve type Small, left, separable float chamber fed by a gummy-hose from the top. Inlet fuel muffler's inner dia 25,4 H 8 mm. Supplied with straight air cleaner dia 80 mm, provided with a rotatory shutter. Dia of the flange for air cleaner fixing dia 35 H 9 mm. Max. dimensions with air cleaner: 120 × 99 × 140 mm. Finish: Special zinc- plated polished surface. Aprox. weight incl. air. cleaner 0,87 kg.

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Item. No.	Ordering Reference	DESCRIPTION
40e	2922 (not illustr.)	For 200 to 250 ccm engines. Intake dia 22 mm. Single throttle valve type. Big, left, separable float chamber fed by a fuel pipe with cap nut from the bottom. Inlet fuel muffler's inner dia 28,6 H 8 mm. Dia of the flange for air cleaner fixing: 35 H 9 mm. Supplied with straight air cleaner dia 80 mm, provided with a rotatory shutter. Max. dimensions incl. air cleaner: 123 × 120 × 150 mm. Finish: Special zinc-plated polished surface. Aprox. weight incl. air. cleaner 1.02 kg.
40f	2924 (not illustr.)	For 250 ccm one-cylinder or 500 ccm two-cylinder engines. Single throttle valve type. Big, left, separable float chamber, fed by a fuel pipe with cap nut from the bottom. Inle fuel muffler's inner dia 28,6 H 8 mm. Dia of the flange for air cleaner fixing 35 H 9 mm. Supplied with straight air cleaner dia 80 mm, provided with a rotatory shutter. Max. dimensions incl. air cleaner: 123×120×150 mm. Finish: Special zinc-plated polished surface. Aprox. weight incl. air. cleaner 1.03 kg.
40g	2924 V (not illustr.)	For 250 ccm engines. Intake dia 24 mm. Single throttle valve type. Big, left, separable float chamber, fed a fuel pipe with cap nut from the top. Inlet fuel muffler's inner dia: 28,6 H 8 mm.. Dia of the flange for air cleaner fixing 35 H 9 mm. Supplied with straight air cleaner dia 80 mm, provided with a rotatory shutter. Max. dimensions incl. air cleaner: 125 × 120 × 150 mm. Finish: Special zinc-plated polished surface. Aprox. weight incl. air. cleaner 1.— kg.
40h	2912 (not illustr.)	For 50 ccm engines. Intake dia 12 mm. Single thottle valve type. Left, not separable float chamber, fed by a gummy-hose from the top (horizontally). Inlet fuel flange with two M 5 screws, fixing centres 33 ± 0.1 mm, distance between top fixing screw's and fuel intake's centres 13 mm. Supplied with straight air cleaner dia 70 mm. Provided with an injection valve for starting. Max. dimensions incl. air cleaner: 87.5 × 62 × 100 mm surface. Finish: Special zinc- plated polished. Aprox. weight incl. air. cleaner 0,35 kg.

Item. No.	Ordering Reference	DESCRIPTION
		STEERING WHEELS
41		For passenger cars, trucks, tractors and busses as ordered.

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SUPPLEMENTS

Item. No.	Ordering Reference	DESCRIPTION
101	20-9430.13	**STARTING PUSH BUTTON SWITCHES** Flush mounted. Mounting board thickness 1 to 3 mm. Mounting opening dia 25.5 ± 0.2 mm. Max. height above the board 12 mm, under the board 45 mm. Finish: moulded n bakelite. Housing black, white or black operating knob. Aprox. weight: 0,035 kg.
102	20-9430.17	**HORN PUSH BUTTON SWITCHES** Flush-mounted. Mounting opening dia 20,5 mm. Mounting board thickness 1 to 2 mm. Max. height above the board 12 mm, under the board 32 mm. Finish: moulded n bakelite. Black housing, white operating knob. Aprox. weight: 0,02 kg.
103	2-9432.00	**BATTERY MAIN SWITCHES** For disconnecting the battery main from the starter and switch box. Mounting opening dia 22.5 mm. Max. mounting board thickness 15 mm. Max. height under the board 40 mm. Holes for two fixing screws dia 6 mm. Removable operating handle. Finish: zinc-plated housing. Aprox. weight: 0,20 k..
104	Type No. 1 8,15,25 Amp.	**STONE FUSES 6× 25 mm – Type No. 1.** Special types 40 and 50 amp. on request. Aprox. weight of 100 pcs: 0,15 kg. Aprox. weight of 100 paper boxes to 10 fuses: 1.60 kg.
105	Type No. 2 8,15,25 Amp.	**STONE FUSES 7 × 17 mm – Type No. 2.** Sizes 30 and 40 amp. on special request. Aprox. weight of 100 pcs: 0,15 kg. Aprox. weight of 100 paper boxes to 10 fuses: 1.60 kg.
106	Type No. 3 10 & 25 Amp.	**GLASS FUSES FOR AMERICAN CARS** 6.3 × 32 mm — Type No. 3. Standard supplied 10 and 25 Amp. On request 20 and 30 Amp. Aprox. weight of 100 pcs: 0,15 kg. Aprox. weight of 100 paper boxes to 10 fuses: 1.65 kg.
107	676	**VALVE REPAIR TOOLS** Repairs both inside and outside thread and smooth lips of tyre valve deflates ube and aplies or removes valve cores. Aprox. weight: 0.018 kg.

Item. No.	Ordering Reference	DESCRIPTION
108	VC 37	**VALVE REPAIR SETS** containing. 1 pc Repair tool No. 676 (sea item No. 107). 1 box of 5 valve cores No. 406 (item 34j). 1 box of 5 valve caps No. 65 (item No. 34f). Aprox. weight: 0.04 kg/1 paper box.
109	NH MOTEX	**FOOT OPERATED TYRE PUMPS** Barell dia 60 mm. Length of the barell 165 mm. Woven hose 650 mm long provided with simple straight or Lock Tite Air Chuck. The cover operating as air-dip-lever. Dimensions: 380 × 130 × 110 mm. Finish: in various colours. Aprox. weight: 3.— kg.
110	8-9344.00	**WING LAMPS** Provided with front and top opal glass. Dished base. Supplied with rubber pad. Max. length: 325 mm. For 1 bulb socket BA 15s. Supplied without bulbs. Finish: all chromium- plated. Aprox. weight: 0.31 kg.
111	2-9187.04	**SLIDING-ARMATURE STARTERS 6 HP** 150 mm (5 5/16″) yoke dia. 24 Volts. Clockwise. Cradle mounting. Spigot dia 56 mm (2 3/16″). Flywheel clearence 39 mm (1 9/16″). Pinion: 11 teeth, modul 3. Return circuit through frame. Min. Storage Battery Capacity 150 Amp. Hours. Similar to Bosch BPD 6/24 ARS 150. Aprox. weigh: 25.— kg.
112	2-9087.02	**GENERATORS** For cradle mounting 150 mm (5 5/16″) yoke dia. Clockwise. Rated Voltage: 24 Volts. Service Voltage: 27 Volts, Rated power: 300 Watts. Rated speed 1200, maximum speed 4500 R. P. M. Without built-in fan. Similar to Bosch: GQ 300/24/1200 AR 1. To be used only with Regulator PAL. No. 2-9405.21 (separately mounted), sea item No. 112 a. Aprox. weight: 20.50 kg.
112a	2-9405.21	**REGULATORS** To be used only with Generator PAL No. 2-9087.02 (sea item No. 112). For separate mounting. Aprox. weight: 1.35 kg.

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Item. No.	Ordering Reference	DESCRIPTION
113	NC 50	**INJECTION TESTER** For testing of injection nozzles and for the adjustment of injection valves of all 3 sizes to the prescribed injection pressure. Dial range of the pressure gauge: 0 to 600 kg/cm². Max. height: 516 mm. Round pedestal dia 110 mm, provided with 3 holes dia 10.5 mm for fixing screws. Aprox. weight: 13.— kg.
114	DCeOS610	**PINTLE NOZZLES** Similar to Bosch DNOSD21. Aprox. weight: 0.04 kg.
115	DC12S610	**PINTLE NOZZLES** Similar to Bosch DN12SD12. Aprox. weight: 0.04 kg.

Remarks: to fig. 114 & 115:
Various other types available. When ordering please state BOSCH Nos.

116	PPK	**PPK ELEMENTS FOR INJECTION PUMPS** Various sizes equal to Bosch marking. Aprox. weight: 0.10 kg.

MOTOKOV

PRAHA CZECHOSLOVAKIA

3023/73/Mo a-5811—St 03-30668

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CONDUCTED BUS-TOURS AND SIGHT-SEEING TRIPS

for visitors to the Brno International Trade Fair
Sept. 6th - Sept. 20th 1959

Sight-seeing trips through Brno /daily/

Centre of the city, Lužánky, Winter Stadium, Sports Stadium, the Jan Sverma Spartak Works, Veveří ul. /Botanical Gardens/, Náměstí Míru /Peace Square/, Kraví Hora /"Cow Mountain"/, observatory, Wilson Wood /Kaunic College/, Žabovřesky, Komín, Bystrc /Mniší hora - Monk's Hill, Zoo/, Kníničí Dam, Jundrov /valley of the river Svratka/, Pisárky /the Brno motorcycle track/, exhibition grounds, Mendl Square /Mendl, Křižkovský, Janáček/, Pekařská ulice/ old hospital/, Šilingrovo náměstí, Old Town Hall, nám. Svobody /Liberty Square/.
Departure from exhibition grounds at 8.30 a.m.
Price: USA $ 1,-
The price includes tranportation, insurance, guide
This sight-seeing trip lasts 3 hours approx.

Daily round trips through the Moravian Karst and to Rájec Castle on the Svitava River

Brno - Vranov Woods - St.Catherine's Church /gothic/, Blansko, Rájec n.Svitavou /castle/, Sloup, the Punkva Caves with Fairytale Dome, boat trip /bottom of the Macocha Abyss/, Upper Bridge of the caves, Balcarka, Jedovnice, Křtiny, Brno
Departure from exhibition grounds at 8.30 a.m.
back in Brno at 6 p.m. approx.
Price: USA $ 3,-

Bus round /on Tuesdays/ to Tišnov, Nedvědice, Pernštejn, Lysice, Černá Hora
Departure from Brno at 8.30 a.m., back in Brno at 6,30 p.m. approx. Departure from the Turista Travel Office
Price: USA $ 2,50

Brno-Bystrc- along the Kníničí storage lake to Veveří Castle to Vevrská Bitýška - Tišnov Předklášteří /architectural relic "Porta Coeli"/, Doubravník, Nedvědice - Pernštejn Castle, Vír Dam, Lysice Castle - Černá Hora - Brno.

By bus to the Peace Monument /Mohyla míru/ Slavkov /Austerlitz/, Bučovice, Vyškov /on Wednesdays/

Brno - Šlapanice, Peace Monument /inspection of the castle/, Vyškov, museum, Dědice /birthplace of the late President Gottwald/, Rousínov, Brno
Departure at 8 a.m. from the Turista Travel Office, Brno, back in Brno at 6.30 p.m. approx.
Price: USA $ 2,50

Beatiful Southern Moravia /bus-tour, on Thursdays/

Brno, Rajhrad, Židlochovice, Podivín, Lednice /Castle/, hunting museum, minaret, winter garden, park /Mikulov, Dolní Věstonice, Mušov, Pohořelice, Brno
Departure at 8.30 a.m. from the Turista Travel Office in Brno, back in Brno 6.30 p.m. approx.
Price USA $ 3,-

Bus Tour to Náměšť /on Fridays/

Brno, Bystrc, along the storage lake of the Kníničky Dam to Veveří Castle and to Ostrovačice Lodge, Říčny, Devět křížů near Domášov, Velká Bíteš, Náměšť n.Osl. - inspection or the castle, Kralice /memorial of the Kralice Bible/, Zastávka near Brno /mining area of Rosicko-Oslavany/, Rosice, part of the "Brno Ring" race track - Brno

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Departure at 8.30 a.m. from the Turista Travel Office, back in Brno at 6 p.m. approx.
Price USA $ 2,50

Sunday bus - tour - the folklore of Moravské - Slovácko - Luhačovice - Gottwaldov

Brno - Buchlovice /inspection of the castle/, Uherské Hradiště, Vlčnov /national costumes/ Uherský Brod /inspection of the Komenský Museum/, Luhačovice /most beautiful Moravian spa/, Gottwaldov, the city of socialist construction, regional centre, Velehrad, baroque architectural relic, excavantions, Střílky /baroque cemetery/, Brno
Departure at 6 a.m. from the Turista Travel Office in Brno
Price USA $ 4,50

Departures from the Turista Travel Office, Brno Nám. Svobody 4, phone 34284

List of Čedok Places of Accomodation

College buildings
/for accommodating visitors to the Fair/

1. Rektorát VŠZ, Babákova 3/5
2. " UKB, Tvrdého 5/7
3. " " Tvrdého 14.
4. " " Náměstí Míru 4
5. " VUT, Bulharská 105

Student homes

6. Krajská zdravotní škola, Grohova 14
7. Tesla n.p. Jílova 38
8. MěNV - odbor škol, Cihlářská 21
8a MěNV - odbor škol, Drobného 22
9. Ingstav, Stavařov, Lomená 42/44
10. Pozemní stavby, Stavařov, Lomená 40

Hotels

97. Grandhotel, Třída 1.máje
98. Hotel Evropa, Jánska 1
99. Hotel Avion, Česká 20
100. Hotel Slavia, U solnice 13/15
101. Hotel Plzeňský dvůr, Jakubské nám.9
102. Hotel Morava, Novobranská 3
103. Hotel Slovan, Lidická 23
104. Hotel Metropol, Dornych.5
105. Hotel Korso, Kopečná 10
106. Hotel Tatran, Kopečná 16
108. Hotel Společenský dům, Horova 30

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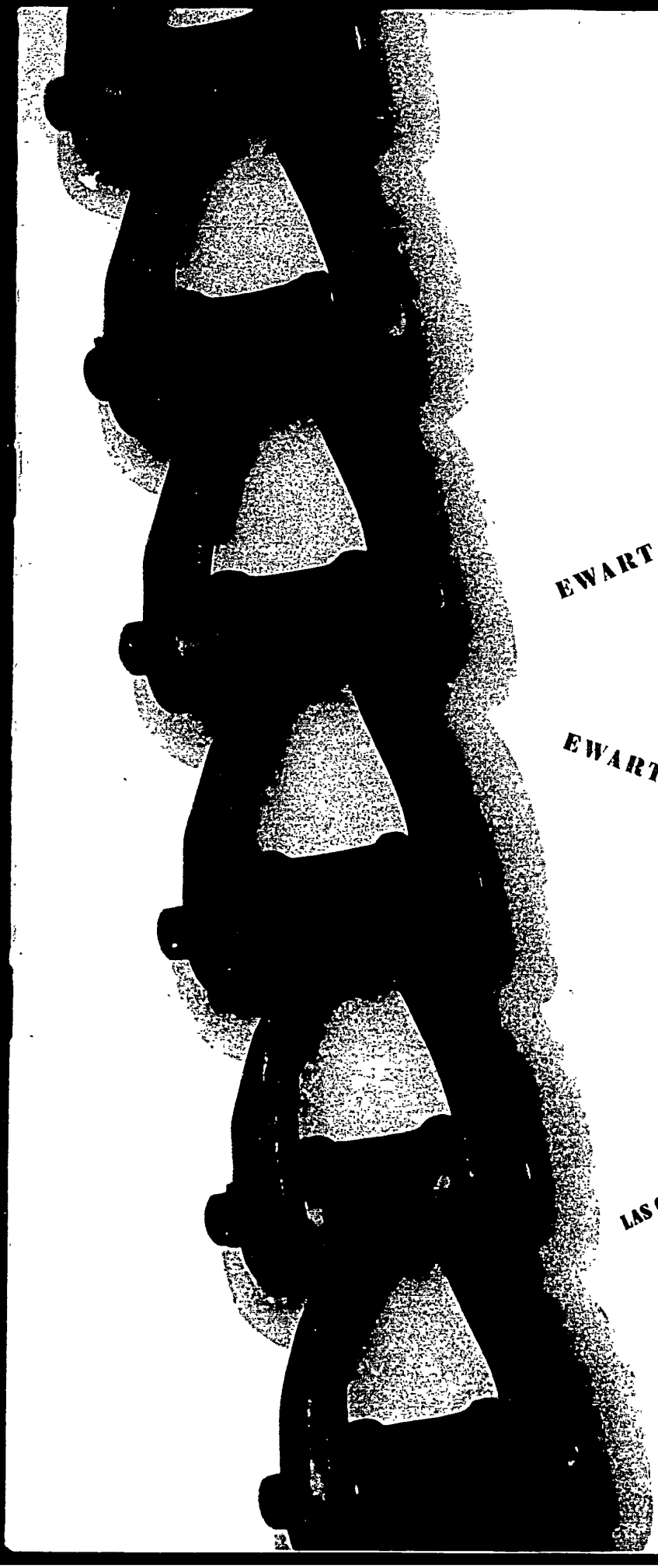

EWART AND BOLT CHAINS

EWARTS- UND BOLZENKETTEN

LAS CADENAS DE EWART Y LAS CADENAS BULONES

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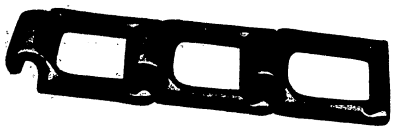
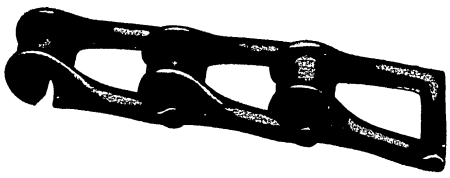
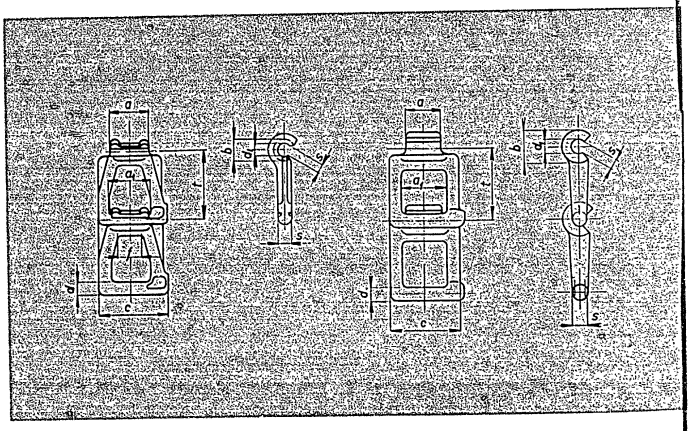




Marking: Chain t × length
ČSN 02 3372
Example: Chain 40 × 20
ČSN 02 3372

Bezeichnung: Kette t × Länge
ČSN 02 3372
Beispiel: Kette 40 × 20
ČSN 02 3372

Indicación: Cadena t × longitud ČSN 02 3372
Ejemplo: Cadena 40 × 20
ČSN 02 3372



NORMAL AND STRENGTHENED EWART CHAIN

Material: Malleable cast iron.
Workmanship: Clean cast; the pitch tolerance t of individual links is 1 % of the pitch, but the tolerance of 20 links 0,5 % of that length will not be exceeded, when we have in mind a composed chain. The diameter f represents the toothing width of sprocket.
The test load is 0,5 of load at breaking.
The weights are calculated out of specific weight of malleable cast iron 7,4 kg/dm³.
Delivery: The chain will be delivered composed of individual links.

NORMALE UND VERDICKTE EWARTSKETTE

Material: Tempergusseisen.
Ausführung: Sauber gegossen; die Toleranz der Teilung der einzelnen Glieder ist 1 % der Teilung, dabei wird bei der zusammengesetzten Kette die zulässige Toleranz der 20 Glieder 0,5 dieser Länge nicht überschritten. Mass f ist die Kettenradzahnbreite.
Probebelastung ist 0,5 der Belastung beim Reissen. Gewichte werden von spezifischem Tempergussgewicht 7,4 kg/dm³ ausgerechnet.
Lieferung Die Kette wird aus einzelnen Gliedern zusammengesetzt geliefert.

CADENA DE EWART NORMAL Y REFORZADA

Material Fundición maleable
Ejecución: Fundido lisamente, la tolerancia del paso t de los eslabones individuales está 1 % del paso, pero al mismo tiempo en la cadena compuesta no se puede pasar la tolerancia de 20 eslabones 0,5 % de esta longitud.
La dimensión f es el ancho de la dentadura de la cadena de rueda.
La carga de prueba es 0,5 de la carga en la rotura Los pesos están calculados del peso específico de la fundición maleable 7,4 kg/dm³.
Entrega La cadena está entregada compuesta de los eslabones individuales.

Pitch Teilung Paso t		a		a_1		f		b		d		d_1		c		$s_1 = s$		Chain load Kettenbelastung Carga de la cadena permissible zulässige permisible		at breaking beim Reissen en la rotura		Weight Gewicht Peso		Pieces in 1 m Stück pro 1 m Piezas en 1 m	
in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	lb	kg	lb	kg	lb/10 ft	kg/m	10/ft	m
0,787	20	0,354	9	0,413	10,5	0,314	8	0,393	10	0,157	4	0,165	4,2	0,708	18	0,110	2,8	61,72	28	493,83	224	3	0,44	151,4	50
0,984	25	0,433	11	0,492	12,5	0,354	9	0,472	12	0,196	5	0,204	5,2	0,856	22	0125	3,2	102,31	50	881,85	400	3,50	0,53	121,9	40
1,259	32	0,590	15	0,669	17	0,511	13	0,551	14	0,236	6	0,244	6,2	1,102	28	0157	4	176,37	80	1410,96	640	5,64	0,84	95,2	31,3
1,574	40	0,866	22	0,944	24	0,590	15	0,708	18	0,314	8	0,322	8,2	1,574	40	0,196	5	330,69	150	2645,56	1200	12,56	1,87	76,2	25
1,968	50	0,984	25	1,062	27	0,629	16	0,866	22	0 373	10	0,405	10,3	1,889	48	0,236	6	551 15	250	4409,26	2000	19,08	2,84	60,9	20
2,480	63	1,456	37	1,535	39	0,866	22	0,984	25	0,472	12	0,484	12,3	2,480	63	0,314	8	694,45	315	5555,67	2520	26,68	3,97	48,3	15,9
3,149	80	1,771	45	1,850	47	1,102	28	1 181	30	0,590	15	0,602	15,3	3,149	80	0,393	10	1322,80	600	10582,24	4800	41,99	6,25	38,1	12,5
3,937	100	2,086	53	2,165	55	1,259	32	1,417	36	0,748	19	0,759	19,3	3,740	95	0,511	13	2204,63	1000	17637,07	8000	60,14	8,95	30,4	10

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SIDE ATTACHMENT LINKS

The attachment links are made in left or right workmanship. This will be described in marking with a suplementary number behind the standard number.
The suplementary numbers sign:
1 - left workmanship,
2 - right workmanship.
Other diameters and the dates, the material and permissible load see ČSN 02 3372.
The side links are delivered without holes.
The weights are calculated out of specific weight of malleable cast iron 7,4 kg/dm³.

SEITENVERBINDUNGSGLIEDER

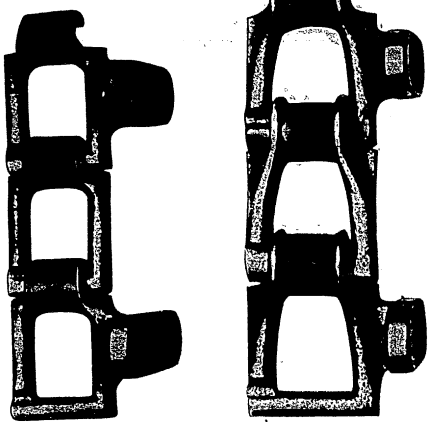
Verbindungsglieder werden in linker oder rechter Ausfuhrung hergestellt. Jede Ausführung wird in Bezeichnung durch eine Ergänzungsnummer hinter der Normzahl vorgeschrieben. Die Ergänzungsnummer bezeichnen.
1 - linke Ausführung.
2 - rechte Ausführung
Andere Massen und Angaben, Material und zulässige Belastung sieh ČSN 02 3372.
Seitenglieder werden ohne Löcher geliefert.
Gewichte werden von spezifischem Tempergussgewicht 7,4 kg/dm³ ausgerechnet.

LATERALES ESLABONES DE UNIÓN

Los eslabones de unión están fabricados en ejecución izquierda y derecha. La ejecución se ordena en la indicación por un número de complemento delante del número de la norma. Los números de complemento denominan
1 - ejecución izqierda,
2 - ejecución derecha.
Las otras dimensiones y los datos, el material y la carga permisible según ČSN 02 3372.
Los eslabones laterales están suministrados sin aberturas. Los pesos están calculados del peso especifico de la fundición maleable 7,4 kg/dm³.

Pitch Teilung Paso t		Pitch of attachment Anschlussteilung Paso de la unión				b		Hole Loch Abertura			s		p		Weight Gewicht Peso		Pieces in 1 m Stück pro 1 m Piezas en 1 m	
		t_1		tolerances Toleranzen tolerancias				d_1		for screw für Schraube para tornillo								
in	mm	in	mm	in	mm	in	mm	in	mm		in	mm	in	mm	lb	kg	10/ft	m
0,787	20	0,629	16	±0,011	±0,3	0,433	11	0,228	5,8	M5	0,157	4	0,590	15	0,035	0,016	151,4	50
0,984	25	0,944	24	±0,015	±0,4	0,472	12	0,275	7	M6	0,196	5	0,826	21	0,077	0,035	121,9	40
1,259	32	1,023	26			0,590	15	0,275	7	M6	0,196	5	0,984	25	0,132	0,060	95,2	31,3
1,574	40	1,259	32	±0,019	±0,5	0,748	19	0,374	9,5	M8	0,236	6	1,181	30	0,275	0,125	76,2	25
1,968	50	1,496	38			0,984	25	0,374	9,5	M8	0,236	6	1,417	36	0,529	0,240	60,9	20
2,480	63	1,653	42			1,181	30	0,452	11,5	M10	0,275	7	1,692	43	1,102	0,500	48,3	15,9
3,149	80	1,968	50	±0,023	±0,6	1,496	38	0,551	14	M12	0,314	8	2,125	54	1,653	0,750	38,1	12,5
3,937	100	2,519	64			1,811	48	0,708	18	M16	0,393	10	2,480	63	3,086	1,40	30,4	10

ČSN 023373



Marking: Link t ČSN 02 3373 workmanship number.*
Example. Link 50 ČSN 02 3373 1.

Bezeichnung: Glied t ČSN 02 3373 Ausführungsnummer.*
Beispiel: Glied 50 ČSN 02 3373.1

Indicación: Eslabón t ČSN 02 3373 número de la ejecución*
Ejemplo: Eslabón 50 ČSN 02 3373 1

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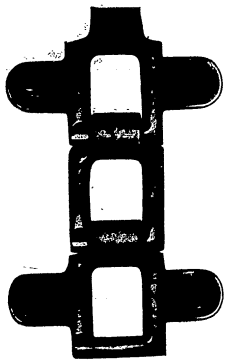
ČSN 02 3374



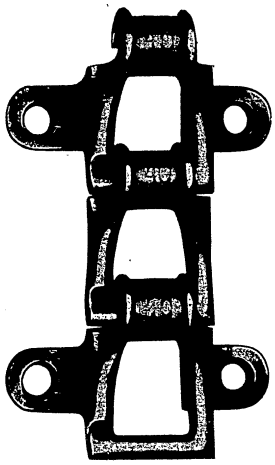
BACK ATTACHMENT LINKS

Other diameters and the dates, the material and permissible load — see ČSN 02 3372.

The weights are calculated out of specific weight of malleable cast iron 7,4 kg/dm³.

Marking: Link ... t ČSN 02 3374.

Example Link ... 25 ČSN 02 3374



HINTERE VERBINDUNGSGLIEDER

Andere Massen und Angaben, Material und zulässige Belastung sieh ČSN 02 3372.

Gewichte sind von spezifischem Temperguss gewicht 7,4 kg/dm³ ausgerechnet.

Bezeichnung: Glied ... t ČSN 02 3374.

Beispiel: Glied ... 25 ČSN 02 3374.

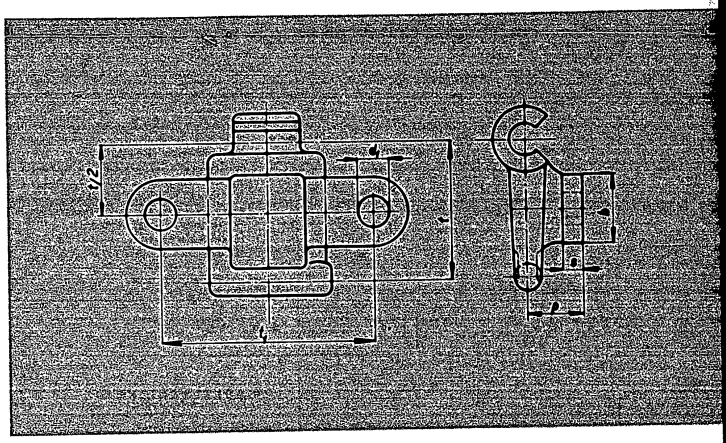
TRASEROS ESLABONES DE UNIÓN

Las otras dimensiones y los datos, el materi: y la carga permisible — según ČSN 02 3372.

Los pesos están calculados del peso especifico de la fundición maleable 7,4 kg/dm³.

Indicación: Eslabón ... t ČSN 02 3374.

Ejemplo: Eslabón ... 25 ČSN 02 3374.



Pitch of chain Kettenteilung Paso de la cadena t		Pitch of attachment Anschlussteilung Paso de la unión t_1		tolerances Toleranzen tolerancias		b		Hole Loch Abertura d_1		for screw für Schraube para tornillo	s		p		Weight Gewicht Peso	
in	mm	in	mm	in	mm	in	mm	in	mm		in	mm	in	mm	lb	kg
0,787	20	1,259	32	± 0,019	± 0,5	0,433	11	0,228	5,8	M5	0,157	4	0,393	10	0,044	0,020
0,984	25	1,574	40			0,472	12	0,275	7	M6	0,196	5	0,433	11	0,088	0,040
1,259	32	1,968	50			0,590	15	0,275	7	M6	0,196	5	0,511	13	0,153	0,070
1,574	40	2,519	64			0,748	19	0,374	9,5	M8	0,236	6	0,708	18	0,341	0,155
1,968	50	2,813	74			0,984	25	0,374	9,5	M8	0,236	6	0,866	22	0,617	0,280
2,480	63	3,622	92	± 0,023	± 0,6	1,181	30	0,452	11,5	M10	0,275	7	0,984	25	1,080	0,490
3,149	80	4,488	114			1,496	38	0,551	14	M12	0,314	8	1,181	30	2,027	0,920
3,937	100	5,748	146			1,811	46	0,708	18	M16	0,393	10	1,417	36	3,681	1,670

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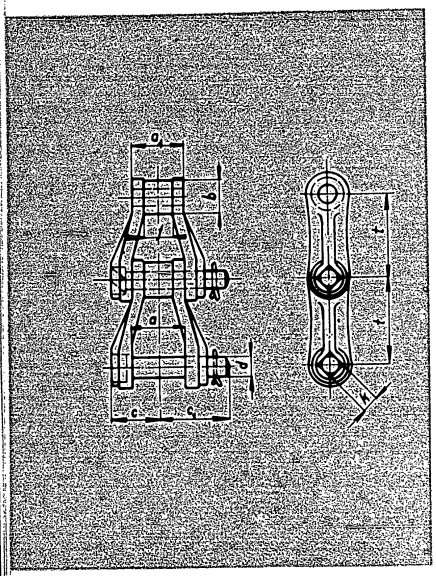
ČSN 02 3382



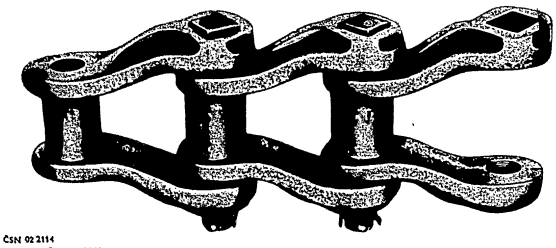
BOLT CHAINS

Material: Malleable cast iron
Workmanship: Clean cast; the pitch tolerance t of individual links is 1 % of the pitch, but the tolerance of 20 links 0,5 % of that length will not be exceeded, when we have in mind a composed chain The diameter f represents the toothing width of sprocket.
The test load is 0,5 of load at breaking
The weights are calculated out of specific weight of malleable cast iron 7,4 kg/dm³.
Delivery: The chain will be delivered composed of individual links with bolts and split pins.

BOLZENKETTEN

Material Tempergusseisen.
Ausführung: Sauber gegossen; die Toleranz der Teilung der einzelnen Glieder ist 1 % der Teilung, dabei wird bei der zusammengesetzten Kette die zulässige Toleranz der 20 Glieder 0,5 dieser Länge nicht überschritten
Mass f ist die Kettenradzahnbreite.
Probebelastung ist 0,5 der Belastung beim Reissen
Gewichte werden von spezifischem Tempergussgewicht 7,4 kg/dm³ ausgerechnet
Lieferung. Die Kette wird aus einzelnen Gliedern zusammengesetzt geliefert, mit Bolzen und Splinte.

Bolts see ČSN 02 2114
Marking: Chain t ČSN 02 3382
Example: Chain 40×20 ČSN 02 3382

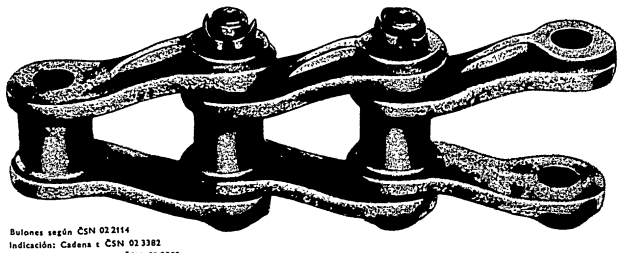


Bolzen sieh ČSN 02 2114
Bezeichnung: Kette t ČSN 02 3382
Beispiel: Kette 40×20 ČSN 02 3382

CADENAS DE BULONES

Material: Fundición maleable.
Ejecución: Fundido lisamente; la tolerancia del paso t de los eslabones individuales está 1 % del paso, pero al mismo tiempo en la cadena compuesta no se puede pasar la tolerancia de 20 eslabones 0,5 % de esta longitud.
La dimensión f es el ancho de la dentadura de la cadena de rueda.
La carga de prueba es 0,5 de la carga en la rotura. Los pesos están calculados del peso específico de la fundición maleable 7,4 kg/dm³.
Entrega: La cadena está entregada compuesta de los eslabones individuales, con bulones y pasadores.

Pitch Teilung Paso t		a		a_1		b		d*		c		c_1		f*		k		Chain load Kettenbelastung Carga de la cadena				Weight Gewicht Peso	
																		permissible zulässige permisible		at breaking beim Reissen en la rotura			
in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	lb	kg	lb	kg	lb/10 ft	kg/m
0,984	25	0,708	18	0,669	17	0,472	12	0,236	6	0,629	16	0,787	20	0,354	9	0,275	7	352,7	160	2822	1280	10,34	1,54
1,259	32	0,984	25	0,944	24	0,550	14	0,275	7	0,826	21	1,023	26	0,511	13	0,314	8	429,9	195	3439	1560	14,91	2,22
1,574	40	1,102	28	1,062	27	0,708	18	0,354	9	0,905	23	1,181	30	0,590	15	0,433	11	628,3	285	5026	2280	21,09	3,14
1,968	50	1,259	32	1,200	30,5	0,866	22	0,433	11	1,141	29	1,417	36	0,629	16	0,511	13	903,9	410	7231	3280	36,68	5,46
2,480	63	1,496	38	1,437	36,5	0,984	25	0,472	12	1,299	33	1,614	41	0,866	22	0,551	14	1356	615	10847	4920	46,17	6,83
3,149	80	1,850	47	1,771	45	1,181	30	0,590	15	1,496	38	1,850	47	1,102	28	0,669	17	1896	860	15168	6880	57,1	8,50
3,937	100	2,244	57	2,165	55	1,417	36	0,708	18	2,047	52	2,519	64	1,259	32	0,787	20	2910	1320	23281	10560	76,134	11,33
4,921	125	2,795	71	2,677	68	1,574	40	0,787	20	2,440	62	2,952	75	1,732	44	0,866	22	4211	1910	33687	15280	116,92	17,40



Bulones según ČSN 02 2114
Indicación: Cadena t ČSN 02 3382
Ejemplo: Cadena 40×20 ČSN 02 3382

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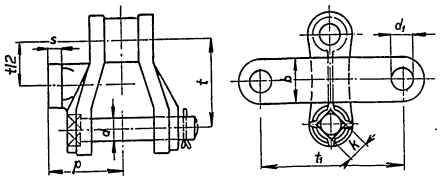
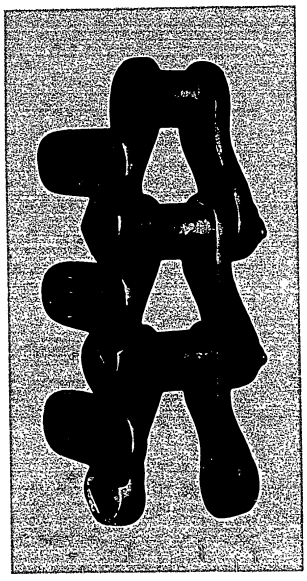
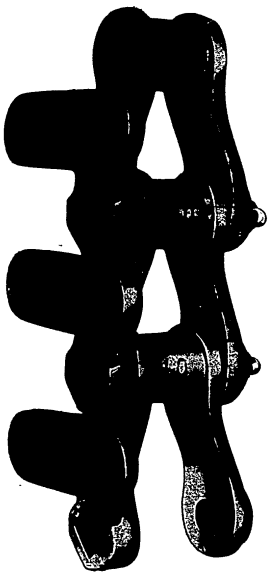


ČSN 02 3383





SIDE ATTACHMENT LINKS

Other diameters and the dates, the material and permissible load — see ČSN 02 3382. The bolts see ČSN 02 2114.

The weights are calculated out of specific weight of malleable cast iron 7,4 kg/dm³.

Marking: Link . . . t ČSN 02 3383.

Example: Link . . . 50 ČSN 02 3383.

SEITENVERBINDUNGSGLIEDER

Andere Massen und Angaben, Material und zulässige Belastung sieh ČSN 02 3382. Bolzen sieh ČSN 02 2114.

Gewichte sind von spezifischem Tempergussgewicht 7,4 kg/dm³ ausgerechnet.

Bezeichnung: Glied t ČSN 02 3383

Beispiel: Glied 50 ČSN 02 3383

LATERALES ESLABONES DE UNIÓN

Las otras dimensiones y los datos, el material y la carga permisible — según ČSN 02 3382. Los bulones según ČSN 02 2114.

Los pesos están calculados del peso específico de la fundición maleable 7,4 kg/dm³.

Indicación: Eslabón . . . t ČSN 02 3383.

Ejemplo: Eslabón . . 50 ČSN 02 3383.

Pitch of chain Kettenteilung Paso de la cadena t		Pitch of attachment Anschlussteilung Paso de la unión t_1		tolerances Toleranzen tolerancias		Hole Loch Abertura b		d_1		s for extra for Extrafalls para extrafalls		s		p		Bolt Bolzen Bulón d		k		Weight Gewicht Paso	
in	mm	in	mm	in	mm	in	mm	in	mm		in	mm	in	mm	in	mm	in	mm	lb	kg
0,984	25	0,944	24	± 0,015	± 0,4	0,472	7	0,275	7	M6	0,196	5	0,826	21	0,236	6	0,275	7	0,132	0,06
1,259	32	1,023	26			0,590	7	0,275	7	M6	0,196	5	0,984	25	0,275	7	0,314	8	0,242	0,11
1,574	40	1,259	32			0,748	9,5	0,374	9,5	M8	0,236	6	1,181	30	0,354	9	0,433	11	0,396	0,18
1,968	50	1,496	38	± 0,019	± 0,5	0,984	9,5	0,374	9,5	M8	0,236	6	1,417	36	0,433	11	0,511	13	0,837	0,38
2,480	63	1,653	42			1,181	11,5	0,452	11,5	M10	0,275	7	1,692	43	0,472	12	0,551	14	0,925	0,42
3,149	80	1,968	50			1,496	14	0,551	14	M12	0,314	8	2,021	54	0,590	15	0,669	17	1,807	0,82
3,937	100	2,519	64	± 0,023	± 0,6	1,811	18	0,708	18	M16	0,393	10	2,480	63	0,708	18	0,787	20	4,078	1,85
4,921	125	2,953	75			2,165	18	0,708	18	M16	0,472	12	2,913	74	0,787	20	0,866	22	7,650	3,47

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Other diameters and the dates, the material and permissible load — see ČSN 02 3382.

The weights are calculated out of specific weight of malleable cast iron 7,4 kg/dm³.

Marking: Link ... t ČSN 02 3384.

Example: Link .. 25 ČSN 02 3384.

BACK ATTACHMENT LINKS

Andere Massen und Angaben, Material und zulässige Belastung sieh ČSN 02 3382.

Gewichte sind von spezifischem Tempergusgewicht 7,4 kg/dm³ ausgerechnet.

Bezeichnung: Glied ... t ČSN 02 3384.

Beispiel: Glied ... 25 ČSN 02 3384.

HINTERE VERBINDUNGSGLIEDER

Las otras dimensiones y los datos, el material y la carga permisible — según ČSN 02 3382.

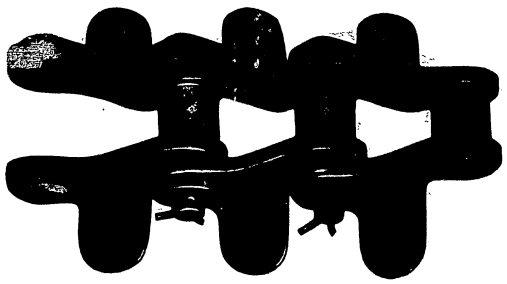
Los pesos están calculados del peso específico de la fundición maleable 7,4 kg/dm³.

Indicación: Eslabón ... t ČSN 02 3384.

Ejemplo: Eslabón ... 25 ČSN 02 3384.

TRASEROS ESLABONES DE UNIÓN

Pitch of chain Kettenteilung Paso de la cadena t		Pitch of attachment Anschlussteilung Paso de la unión t_1		tolerances Toleranzen tolerancias		b		Hole Loch Abertura d_1		for screw für Schraube para tornillo	s		p		Bolt Bolzen Bulón d		k		Weight Gewicht Peso	
in	mm	in	mm	in	mm	in	mm	in	mm		in	mm	in	mm	in	mm	in	mm	lb	kg
0,984	25	1,574	40	±0,019	±0,5	0,472	12	0,275	7	M6	0,196	5	0,433	11	0,236	6	0,275	7	1,132	0,06
1,259	32	1,968	50			0,590	15	0,275	7	M6	0,196	5	0,511	13	0,275	7	0,314	8	0,242	0,11
1,574	40	2,519	64	±0,023	±0,6	0,748	19	0,374	9,5	M8	0,236	6	0,708	18	0,354	9	0,433	11	0,440	0,20
1,968	50	2,813	74			0,984	25	0,374	9,5	M8	0,236	6	0,866	22	0,433	11	0,511	13	0,903	0,41
2,480	63	3,622	92			1,181	30	0,452	11,5	M10	0,275	7	0,984	25	0,472	12	0,551	14	1,190	0,54
3,149	80	4,488	114			1,496	38	0,551	14	M12	0,314	8	1,181	30	0,590	15	0,669	17	2,028	0,92
3,937	100	5,748	146			1,811	46	0,708	18	M16	0,393	10	1,417	36	0,708	18	0,787	20	4,254	1,93
4,921	125	7,244	184			2,165	55	0,708	18	M16	0,472	12	1,574	40	0,787	20	0,866	22	7,360	3,34



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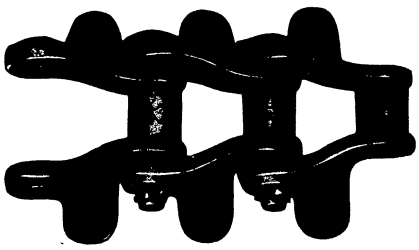

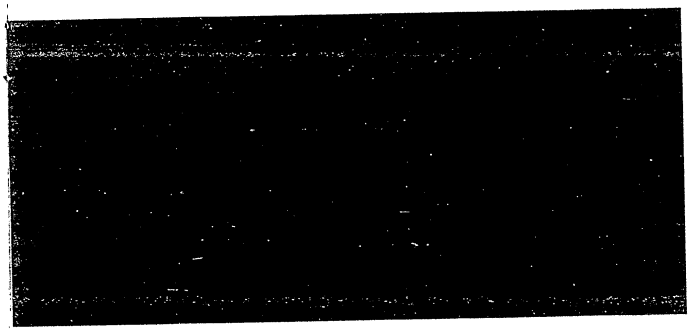

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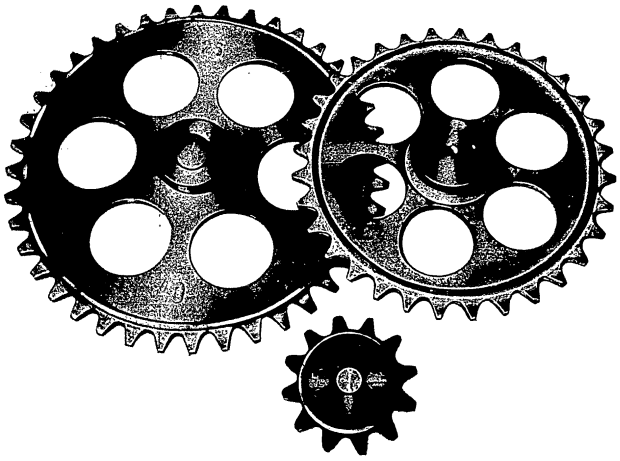


SPROCKET FOR BOLT AND EWART CHAINS

Workmanship: A B C D E

Marking: Wheel t × z × d* ČSN 02 3393, z = number of teeth

Ejemplo: Wheel 50×20×40 ČSN 02 3393

The workmanship A—E depends on gear teeth number (see enclosed table).

* The diameter d when being not prescribed in marking, the gear will be delivered with cored hole of diameter d_1

KETTENRÄDER FÜR BOLZEN UND EWARTSKETTEN

Ausführung: A B C D E

Bezeichnung: Rad t×z×d* ČSN 02 3393.

Beispiel: Rad 50×20×40 ČSN 02 3393, z = Zähnezahl.

Ausführung A—E hängt von Radzähnezahl ab (siehe beigelegte Tabelle)

* Wenn in der Bezeichnung der Durchmesser d nicht vorgeschrieben wird, wird das Rad mit vorgegossenem Loch von Durchmesser d_1 geliefert.

RUEDAS DE CADENA PARA CADENAS DE BULONES Y DE EWART

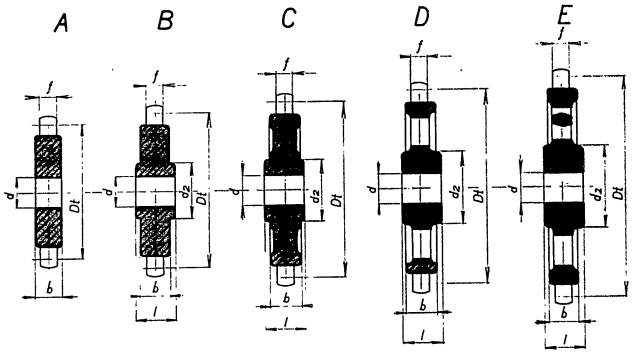
Ejecución: A B C D E

Indicación: Rueda t×z×d* ČSN 02 3393, z = número de los dientes.

Ejemplo: Rueda 50×20×40 ČSN 02 3393.

Ejecución A—E depende del número de los dientes de la rueda (según el cuadro añadido).

* En caso que la dimensión d no está prescrita, la rueda se suministra con un orificio fundido de la dimensión d_1.



ČSN 02 3393

Material grey cast iron
Workmanship clean cast; hub faces are machined

Material: Grauguss.
Ausführung: sauber gegossen; Nabenstirnfläche bearbeitet

Material: fundición gris.
Ejecución: fundido lisamente; las caras de los cubos están acabadas

Teach pitch Zahnteilung Paso de los dientes		Width of toothing Zahnbreite Ancho de la dentadura		Teeth thickness Zahndicke Espesor de los dientes				Workmanship A Ausführung A Ejecución A				Workmanship B—E* Ausführung B—E* Ejecución B—E*					
								d H8		d_1		d H8		d_1		d_2	
in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
0,787	20	0,315	8	0,394	10	0,433	11	0,551–0,629	14–16	0,393	10	0,629–0,787	16–20	0,472	12	1,771	45	0,984	25
0,984	25	0,354	9	0,472	12	0,669	17	0,708–0,866	18–22	0,551	14	0,787–1,259	20–32	0,629	16	2,480	63	1,574	40
1,259	32	0,511	13	0,629	16	0,866	22	0,787–0,984	20–25	0,629	16	0,787–1,417	20–36	0,629	16	2,755*	70*	1,771	45
1,574	40	0,590	15	0,787	20	1,181	30	0,984–1,102	25–28	0,787	20	0,984–1,574	25–40	0,787	20	2,992	76	1,968	50
1,968	50	0,629	16	0,984	25	1,574	40	1,102–1,259	28–32	0,984	25	1,259–1,968	32–50	1,102	28	3,543	90	2,362	60
2,480	63	0,866	22	1,338	34	1,889	48	1,417–1,771	36–45	1,181	30	1,417–2,480	36–63	1,181	30	4,527	115	3,149	80
3,149	80	1,102	28	1,771	45	2,362	60	1,574–1,968	40–50	1,378	35	1,771–2,755	45–70	1,378	35	4,921	125	3,346	85
3,937	100	1,259	32	2,283	58	2,755	70	2,204–2,480	56–63	1,771	45	2,204–3,543	56–90	1,771	45	6,299	160	3,937	100
4,921	125	1,732	44	3,070	78	3,543	90	2,480–2,755	63–70	1,968	50	2,480–3,937	63–100	1,968	50	7,086	180	4,724	120

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ČSN 02 3393

Teeth pitch Zahnteilung Paso de los dientes t		Teeth number Zähnezahl Número de los dientes z	Workmanship Ausführung Ejecución	D_t		Weight Gewicht Peso		Teeth pitch Zahnteilung Paso de los dientes t		Teeth number Zähnezahl Número de los dientes z	Workmanship Ausführung Ejecución	D_t		Weight Gewicht Peso	
in	mm			in	mm	lb	kg	in	mm			in	mm	lb	kg
0,787	20	10	A	2,548	64,73	0,529	0,24	1,968	50	12	B	7,605	193,16	17,152	7,78
		12	B	3,042	77,27	1,080	0,49			16	D	10,090	256,29	16,644	7,55
		16	B	4,036	102,52	1,697	0,77			20	D	12,583	319,63	20,613	9,35
		20	C	5,033	127,85	2,138	0,97			25	D	15,705	398,91	29,431	13,35
		25	C	6,281	159,56	3,086	1,40			32	E	20,082	510,10	37,478	17,00
		32	D	8,032	204,03	3,130	1,42			40	E	25,089	637,27	44,313	20,10
		40	D	10,036	254,93	4,629	2,10	2,480	63	8	A	6,481	164,63	12,830	5,82
0,984	25	8	A	2,573	65,33	0,639	0,29			10	A	8,026	203,87	20,789	9,43
		10	A	3,185	80,90	1,080	0,49			12	C	9,583	243,41	27,778	12,60
		12	A	3,802	96,59	1,543	0,70			16	D	12,713	322,93	33,730	15,30
		16	B	5,044	128,14	3,527	1,60			20	D	15,855	402,74	44,754	20,30
		20	C	6,268	159,21	4,166	1,89			25	E	19,788	502,63	52,470	23,80
		25	C	7,832	199,45	6,283	2,85			32	E	25,304	642,73	65,257	29,60
		32	D	10,041	255,05	6,878	3,12			40	E	31,612	802,96	84,878	38,50
		40	D	12,544	318,64	10,229	4,64	3,149	80	8	A	8,230	209,05	26,014	11,80
1,259	32	8	A	3,292	83,62	1,036	0,47			10	C	10,192	258,88	35,274	16,00
		10	A	4,076	103,53	2,711	1,23			12	D	12,168	309,09	41,667	18,90
		12	B	4,867	123,64	3,269	2,29			16	D	16,144	410,07	53,556	25,20
		16	C	6,457	164,03	6,834	3,10			20	D	20,134	511,41	74,516	33,80
		20	D	8,053	204,57	8,245	3,74			25	E	25,128	638,26	87,543	39,70
		25	D	10,051	255,31	11,353	5,15			32	E	32,132	816,16	119,050	54,00
		32	D	12,852	326,46	16,490	7,48	3,937	100	8	A	10,288	261,32	47,620	21,60
		40	D	16,052	407,85	23,369	10,60			10	C	12,741	323,60	63,934	29,00
1,574	40	8	A	4,113	104,53	3,218	1,46			12	D	15,211	386,37	72,752	33,00
		10	A	5,096	129,44	5,180	2,35			16	D	20,180	512,58	91,712	41,60
		12	B	6,084	154,55	9,369	4,25			20	E	25,162	639,26	122,577	55,60
		16	C	8,072	205,03	11,464	5,20			25	E	31,410	797,83	160,276	72,70
		20	D	10,062	255,71	13,227	6,00			32	E	40,165	1020,20	203,486	92,30
		25	D	12,564	319,13	17,637	8,00	4,921	125	8	A	12,859	326,64	98,326	44,60
		32	D	16,066	408,08	27,557	12,50			10	D	15,925	404,51	110,231	50,00
		40	E	20,071	509,91	29,277	13,28			12	D	19,014	482,96	122,136	55,40
1,968	50	8	A	5,144	130,66	6,128	2,78			16	E	25,225	640,73	168,654	76,50
		10	A	6,370	161,80	10,141	4,60			20	E	31,459	799,08	213,188	96,70
										25	E	39,263	997,29	289,909	131,50

[redacted]

BOLTS FOR BOLT CHAINS

Marking. Bolt d ČSN 02 2114.
Example: Bolt 9 ČSN 02 2114.
Material: Steel.
Workmanship: Head hot pressed.
Split pins: see ČSN 02 1781; split pins with bolts are not delivered. The bolt weights are calculated out of steel specific weight 7,85 kg/dm³.

BOLZEN FÜR BOLZENKETTEN

Bezeichnung: Bolzen d ČSN 02 2114
Beispiel: Bolzen 9 ČSN 02 2114.
Material: Stahl.
Ausführung: Kopf warmgepresst.
Splinte: siehe ČSN 02 1781; Splinte mit Bolzen werden nicht geliefert. Bolzengewichte sind von spezifischem Stahlgewicht 7,85 kg/dm³ ausgerechnet.

BULONES PARA CADENAS DE BULONES

Indicación: Bulón d ČSN 02 2114.
Ejemplo: Bulón 9 ČSN 02 2114.
Material: Acero.
Ejecución: Cabeza prensada en caliente.
Pasadores: según ČSN 02 1781; pasadores con los bulones no están suministrados Pesos de los bulones están calculados del peso específico del acero 7,85 kg/dm³.

d h 12		l js 14		l_1		v		d_1		k h 14		Weight Gewicht Peso		For bolt chains ČSN 02 3382 t Für Bolzenketten ČSN 02 3382 t Para cadenas de bulones ČSN 02 3382 t	
in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	lb	kg	in	mm
0,236	6	1,417	36	1,181	30	0,118	3	0,062	1,6	0,255	6,5	0,017	0,008	0,984	25
0,275	7	1,850	47	1,555	39,5	0,157	4	0,078	2	0,295	7,5	0,030	0,014	1,259	32
0,354	9	2,086	53	1,712	43,5	0,177	4,5	0,118	3	0,393	10	0,059	0,027	1,574	40
0,433	11	2,559	65	2,086	53	0,275	7	0,118	3	0,472	12	0,108	0,049	1,968	50
0,472	12	2,913	74	2,421	61,5	0,275	7	0,157	4	0,511	13	0,145	0,066	2,480	63
0,590	15	3,340	85	2,795	71	0,314	8	0,157	4	0,629	16	0,266	0,121	3,149	80
0,708	18	4,566	116	3,799	96,5	0,433	11	0,196	5	0,748	19	0,513	0,233	3,937	100
0,787	20	5,393	137	4,527	115	0,511	13	0,196	5	0,826	21	0,727	0,330	4,921	125

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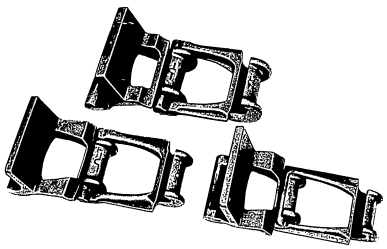


EWART AND BOLT CHAINS OF MALLEABLE CAST IRON

The use of the Ewart and bolt chains is universal. We find them in all industrial branches, where severe working conditions are existing due to vapour, dust, sand, mire, etc., as for example in the conservation factories, sugar mills, tile and brick works, coal mines, sugar mills, universally in the agriculture and other fields.

Their great advantage is the fact, that every damaged link can be replaced in the shortest time, without breaking the continuity of running. The proportionally small circumferential velocity precludes the possibility of damage at breaking. Because of their resistance to the disadvantageous influences of the environment and there, where it is necessary to work at higher temperatures, the Ewart and bolt chains compensate for a belt drive successfully.

TECHNICAL DATA. The Ewart and bolt chains production is mostly mechanical, multiple and is guaranting the prescribed quality of each individual link, as the material structure, appearance and tolerance of the prescribed pitches are concerned. When manufacturing the model equipment for the Ewart and bolt chains production, care is being taken to secure the proper casting technology and guarantee the prescribed quality of the manufactured links, i. e. the required size and casting quality keeping by competent pouring.

The model equipment is manufactured for 8,5 % shrinkage.

The pitch tolerance of the individual links is 1 % of this pitch. In this way, we have in mind a composed chain, the tolerance of twenty links 5,5 % of that length will not be exceeded. The chain links are manufactured of ferritic malleable cast iron and the obtained mechanical characteristics are as follows:

Tensible strength — 32—45 kg/mm²
Ductility — 8—12 %

The sprockets are manufactured of gray cast iron of high quality. The raw materials used for the charge preparation are carefully sorted and treated. The continuous checking of the melting material is carried out daily and at the same time the test specimens are casted of diameter in accordance with the corresponding wall thickness according to valid standards.

All cast iron is separately heat hardened and at the same time all sorts of the manufactured castings are checked with regard to the break quality.

Before shipping, each link is carefully checked and subjected to a test load in a special test station. The test load is four times higher than that of the safe load, at which the chain has to work.

Permissible load size is given in tables.

In your order kindly state the number of the chain and meter number in accordance with standards.

The chains are sent in bundles, composed of individual sprockets in a length of 2,5 m. The attachment links are sent separately, in the same manner in bundles.

Besides the chains in accordance with *CSN* we manufacture the chains, corresponding to the American, English, German and Russian Standards

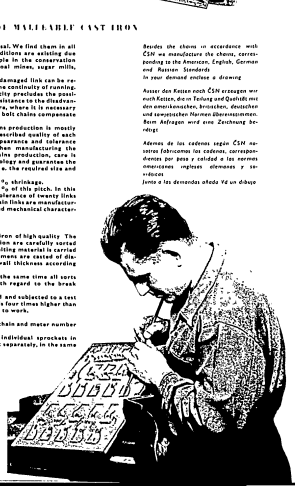
In your demand enclose a drawing

Ausser den Ketten nach *CSN* erzeugen wir auch Ketten, die im Teilung und Qualität mit den amerikanischen, britischen, deutschen und sowjetischen Normen übereinstimmen.

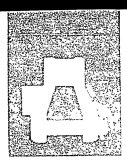
Beim Anfragen wird eine Zeichnung beigelegt

Además de las cadenas según *CSN* nosotros fabricamos las cadenas, correspondientes por paso y calidad a las normas americanas, inglesas, alemanas y soviéticas

Junto a las demandas añada Vd un dibujo



1. *Hand finish of moulding machinery for the Ewart and bolt chains.*
1. *Handanfertigung der Formmaschinen für Ewarts- und Bolzenketten.*
1. *El afinado manual del mecanismo de moldurar para las cadenas de Ewart y las cadenas de bulones*



All special conditions must be stated by letter and included in the confirmation of order. The prices given in this catalogue are informative only and may be increased or decreased without notice. The prices are binding to the confirmed date of despatch.

Payment: The conditions of payment are included in the confirmation of order and any additional acceptance of payment bilaterally agreed on may be made only with the consent of the enterprise of foreign trade MOTOKOV.

Packing: Delivered chains are protected against rust in warm lubricating oil and packed in impregnated paper. Chains delivered in pieces or rolls of 2,5 m are packed in cases. Different types of chains are packed separately. The weight of the case usually does not exceed approx. 120 kg.

Delivery: Orders are executed from stock if possible, but if the goods have to be manufactured, they will be supplied as soon as possible.

Guarantee: The guarantee of durability of the chains depends on the maintenance conditions and are stipulated by the agreement of both parties. Goods manufactured by us are guaranteed only against faulty workmanship and flaws in material. Otherwise the general guarantee conditions of MOTOKOV, Praha, Czechoslovakia are valid.

EWARTS- UND BOLZENKETTEN AUS TEMPERGUSS

Die Verwendbarkeit der Ewarts- und Bolzenketten ist vielseitig. Man findet sie in allen Industriezweigen, wo ungünstige Arbeitsverhältnisse durch Einwirkung von Dampf, Staub, Sand, Ton usw. existieren, wie z. B. in den Konservierungsbetrieben, Ziegeleien, Mühlen, Zementfabriken, Bergwerken, Zuckerfabriken, allgemein in der Landwirtschaft und anderwo.

Ihr grosser Vorzug besteht darin, dass jedes beschädigte Glied in der kürzesten Zeit ausgetauscht werden kann, ohne den Dauerbetrieb zu stören. Die relativ kleine Umfangsgeschwindigkeit schaltet die Möglichkeit des Betriebsunfalles beim Reissen aus. Wegen ihrer Widerstandfähigkeit gegen die ungünstigen Umgebungseinwirkungen und wegen ihrer Temperaturbeständigkeit ersetzen die Ewarts- und Bolzenketten mit Erfolg den Riemenantrieb.

TECHNISCHE ANGABEN. Die Erzeugung von Ewarts- und Bolzenketten ist grösstenteils mechanisch, serienmässig und garantiert die vorgeschriebenen Eigenschaften jedes einzelnen Gliedes, was die Struktur des Materials, die Oberflächenbeschaffenheit und Toleranz der vorgeschriebenen Teilungen betrifft. Bei der Herstellung der Modellanrichtung für die Ewarts- und Bolzenkettenerzeugung wird vorgängig darauf geachtet, die Technologie des eigenen Gusses zu sichern und die vorgeschriebenen Eigenschaften der hergestellten Glieder zu garantieren, d. h. die verlangten Massen und die Sicherung der Qualität des Gusseisens durch geeignete Trichterstellung.

Die Modellanrichtung ist für Schrumpfung von 8,5 %, hergestellt. Die Toleranz der Teilung der einzelnen Glieder ist 1 %, dieser Teilung. Dabei wird bei der zusammengesetzten Kette die zulässige Toleranz der zwanzig Glieds: 5,5 %, dieser Länge nicht überschritten.

Die Kettenglieder sind aus dem ferritischen Temperguseisen hergestellt und die erreichten mechanischen Eigenschaften sind folgender:

Zugfestigkeit — 32—45 kg/mm²
Bruchdehnung — 8—12 %

Die Kettenräder werden aus Qualitätsgusseisen hergestellt. Die verwendeten Rohstoffe für die Einsatzvorbereitung werden sorgfältig sortiert und vorbereitet. Die Durchlaufkontrolle des Glasmaterials wird täglich durchgeführt und gleichzeitig werden die Probestäbchen von Diameter nach der Richtwanddicke in Übereinstimmung mit den gültigen Normen abgegossen. Jedes Schmelzen wird abgetrennt getempert und dabei werden alle Sorten der hergestellten Gusseisteile kontrolliert, was die Bruchqualität betrifft.

Vor der Absendung wird jedes Glied vorgängig kontrolliert und der Probebelastung auf dem spezialen Prüfstand ausgesetzt; die Probebelastung ist viermal höher als die zulässige Belastung im Betrieb.

Die zulässige Belastungsgrösse wird in Tabellen angegeben. In der Bestellung geben Sie die Kettennummer und Meterzahl in Übereinstimmung mit den gültigen Normen an.

Die Ketten werden in Rollen von 2,5 zusammengesetzt, oder in Stücken geliefert. Die Anschlussglieder werden separat in derselben Art in Bündeln oder in Stücken expediert.

Alle Spezialbedingungen müssen schriftlich niedergelegt und in die Auftragsbestätigung aufgenommen werden. Die Katalogpreise gelten mit Vorbehalt und können jederzeit erhöht oder herabgesetzt werden. Die bestätigten Preise sind verbindlich zum Datum des Liefertermines.

Zahlung: Die Zahlungsbedingungen sind in der Auftragsbestätigung festgesetzt und jede nachträgliche, beiderseitig vereinbarte Änderung ist nur mit Bewilligung des Aussenhandelsunternehmens MOTOKOV zulässig.

Die Ware bleibt unser Eigentum bis zur vollkendigen Bezahlung.

Versand: Bestellungen werden entweder unmittelbar ab Lager oder im Falle erforderlicher Erzeugung sobald als möglich, je nach Dringlichkeit, zum Versand gebracht.

Verpackung: Die gelieferten Ketten werden gegen Rost in heissem neutralisierten Schmieröl konserviert und in imprägniertem Papier verpackt. Die Ketten sind lieferbar in Rollen à 2,5 m oder in Stücken je nach der Gliederzahl gemessen und in Holzkisten verpackt. Das Gewicht jeder Kiste beträgt höchstens beiläufig 120 kg.

Garantie: Die die Dauerhaftigkeit der Ketten betreffenden Garantiebedingungen sind von den Betriebsbedingungen abhängig und werden auf Grund beiderseitigen Einvernehmens festgesetzt. Auf Ketten wird im Falle einwiger Material- oder Ausführungsmängel eine Garantie gewährt, sonst gelten die allgemeinen Garantie bedingungen der Firma MOTOKOV, Praha, Tschechoslowakei.

2 *Machine workmanship of moulding machinery for the Ewart and bolt chain.*

2 *Maschinelle Fertigung der Formmaschinen für Ewarts und Bolzenketten*

2 *La producción mecánica del mecanismo de moldurar para los cadenas de Ewart y las cadenas de bulones*

LAS CADENAS DE EWART Y LAS CADENAS DE BULONES DE FUNDICIÓN MALEABLE

El uso de las cadenas de Ewart y de las cadenas de bulones es universal. Las encontramos en todas las ramas industriales, donde están las condiciones de trabajo más empeoradas por la influencia del vapor, del polvo, de la arena, de la arcilla etc., como por ejemplo en las fábricas de conserva, en el ladrillal, en los molinos, en los molinos de cimiento, en las minas, en las fábricas de azúcar y en la agricultura.

Sus gran ventaja es la realidad que cada eslabón deteriorado se puede remitir en un tiempo el más corto sin estorbar el servicio continuo por un tiempo más largo. La velocidad circunferencial proporcionalmente pequeña elimina las posibilidades del accidente en la rotura. Por su resistencia contra las influencias deteriorables de los alrededores y allí, donde hay que trabajar en la temperatura más elevada, las cadenas de Ewart y las cadenas de bulones reemplazan la impulsión de correa con buen resultado.

DATOS TÉCNICOS. Por la mayor parte la producción de las cadenas de Ewart y de las cadenas de bulones está mecánica y en serias y garantiza las prescritas calidades de cada eslabón individual, es decir la structura del material, el aspecto y la tolerancia de los pasos prescritos. En la fabricación del aparato de modelo para la producción de las cadenas de Ewart y de las cadenas de bulones una gran atención se presta para asegurar la tecnología de la fundición propia y para garantizar las prescritas calidades de los eslabones fabricados, es decir la dimensión exigida y una aseguración de la calidad de las piezas fundidas por una ejecución conveniente de las fundiciones.

El aparato de modelo está fabricado para la contracción 8,5 %.

La tolerancia del paso de los eslabones individuales es 1 %, de este paso. Al mismo tiempo en la cadena compuesta no está pasada la tolerancia de 20 eslabones 5,5 % de esta longitud.

Los eslabones de cadena están fabricados de la fundición maleable de ferrit y las calidades obtenibles están siguientes:

Resistencia a la tracción — 32—45 kg/cm²
Ductilidad — 8—12 %

Las ruedas de cadena están fabricadas de la fundición gris de una buena calidad. Las materias primas usadas para la preparación de la carga están separadas y cuidadosamente preparadas. Un control de curso del material fundido está realizado diariamente y en el mismo tiempo están fundidas las varillas de prueba del diámetro según la fuerza competente de la pared y las normas válidas.

Cada fundición está fundida individualmente y en este tiempo todas las clases de las piezas fundidas están controladas con respecto a la calidad de la rotura.

Antes de la expedición cada eslabón está cuidadosamente examinado y sometido a una carga de prescrita prueba en una forma de pruebas especial. La carga de prueba está contra veces más larga que la carga permitida, durante la cual la cadena debe trabajar.

La extensión de la carga permisible está indicada en los cuadros.

En los pedidos indique Vd el número de la cadena y el número de los metros según la norma.

Las cadenas expedimos en haces, compuestas de las ruedas individuales de la longitud 2,5 m.

Los eslabones de unión están despachados individualmente, de una manera igual en haces.

Todas las condiciones especiales deben ser tratadas separadamente por escrito incluso en la confirmación del pedido.

Los precios citados en el catálogo sirven solamente a título de información y pueden ser aumentados o bien reducidos sin aviso previo. Sólo valen los precios confirmados correspondientes a la fecha pedida y rodas las excepciones deben ser convenidas.

Condiciones de pago: Las mismas están concedidas en la confirmación del pedido y rodas las excepciones deben ser convenidas.

Condiciones de entrega: Los pedidos se ejecuten directamente del almacén, o desde la fábrica. En el último caso, el pedido será ejecutado a la mayor brevedad posible y según la urgencia del caso.

Embalaje: Las cadenas se entregan conservadas para evitar el orín en aceite calentado y neutralizado, envueltas en papel impregnado. Las cadenas entregadas en piezas o rollos de 2,5 metros se empaquetan en cajas de madera, embaladas en papel impregnado. Las cadenas entregadas en piezas o rollos de 2,5 metros se empaquetan en cajas de madera, embaladas en papel impregnado. La cadenas entregadas en piezas o rollos de 2,5 metros se empaquetan en cajas de madera, embaladas en papel impregnado. El peso de la caja está, por regla general, 120 kg.

Cada clase de cadenas viene embalada separadamente. El mismo será convenido separadamente.

Garantía: El plazo de garantía de las cadenas depende de las condiciones de trabajo. El mismo será convenido separadamente. Garantía: El plazo de garantía de las cadenas depende de las condiciones de trabajo. El mismo será convenido separadamente. Garantía: El plazo de garantía de las cadenas depende de las condiciones de trabajo y de fabricación. En otros respectos se aplican las condiciones generales de la casa MOTOKOV, Praha, Checoslovaquia.

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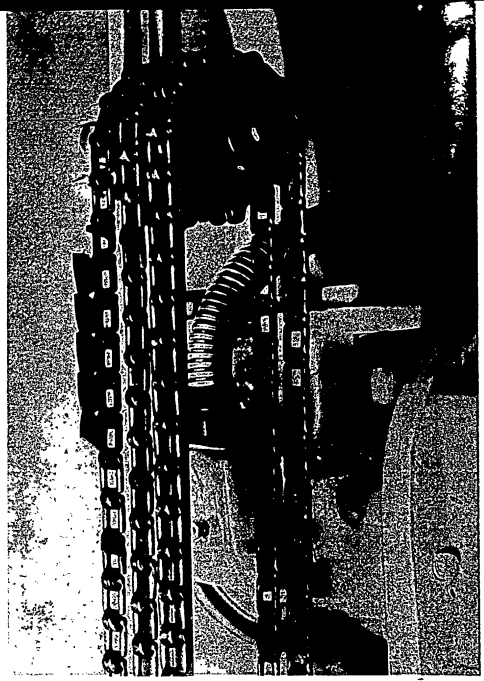
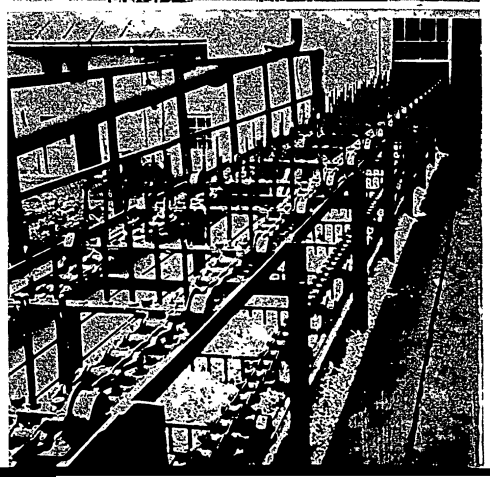
3. *Use of Ewart chains on heavy machines.*

3. *Verwendungsbeispiel der Ewartketten auf schweren Maschinen.*

3. *La muestra del uso de las cadenas de Ewart sobre las máquinas pesadas.*

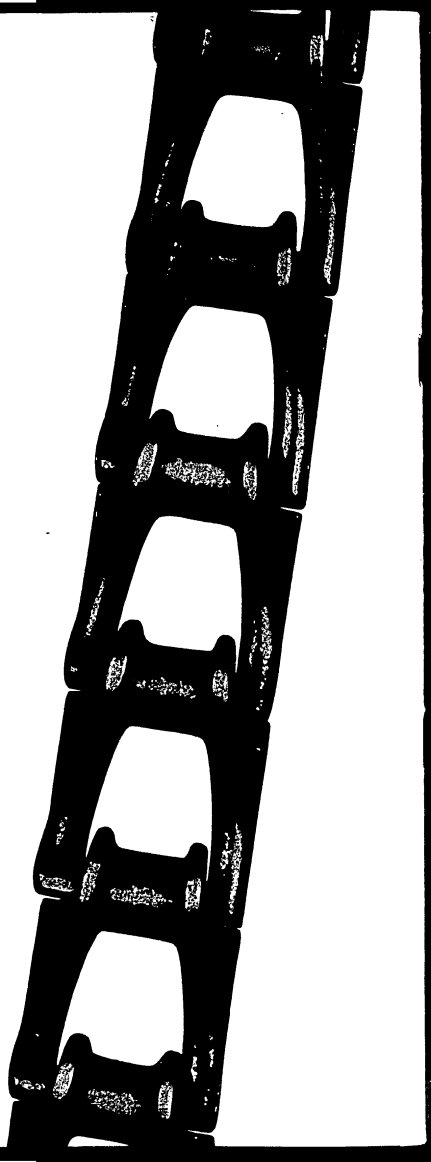




4. *Use of bolt chains in sugar mills: transporter of slices.*

4. *Verwendung der Bolzenketten in Zuckerfabriken: Schnittentransporteur.*

4. *El uso de las cadenas de bulones en las fábricas de azúcar: transportador de pulpas.*



MOTOKOV

PRAHA

třída Dukelských hrdinů 47

Grafia 61, Brno

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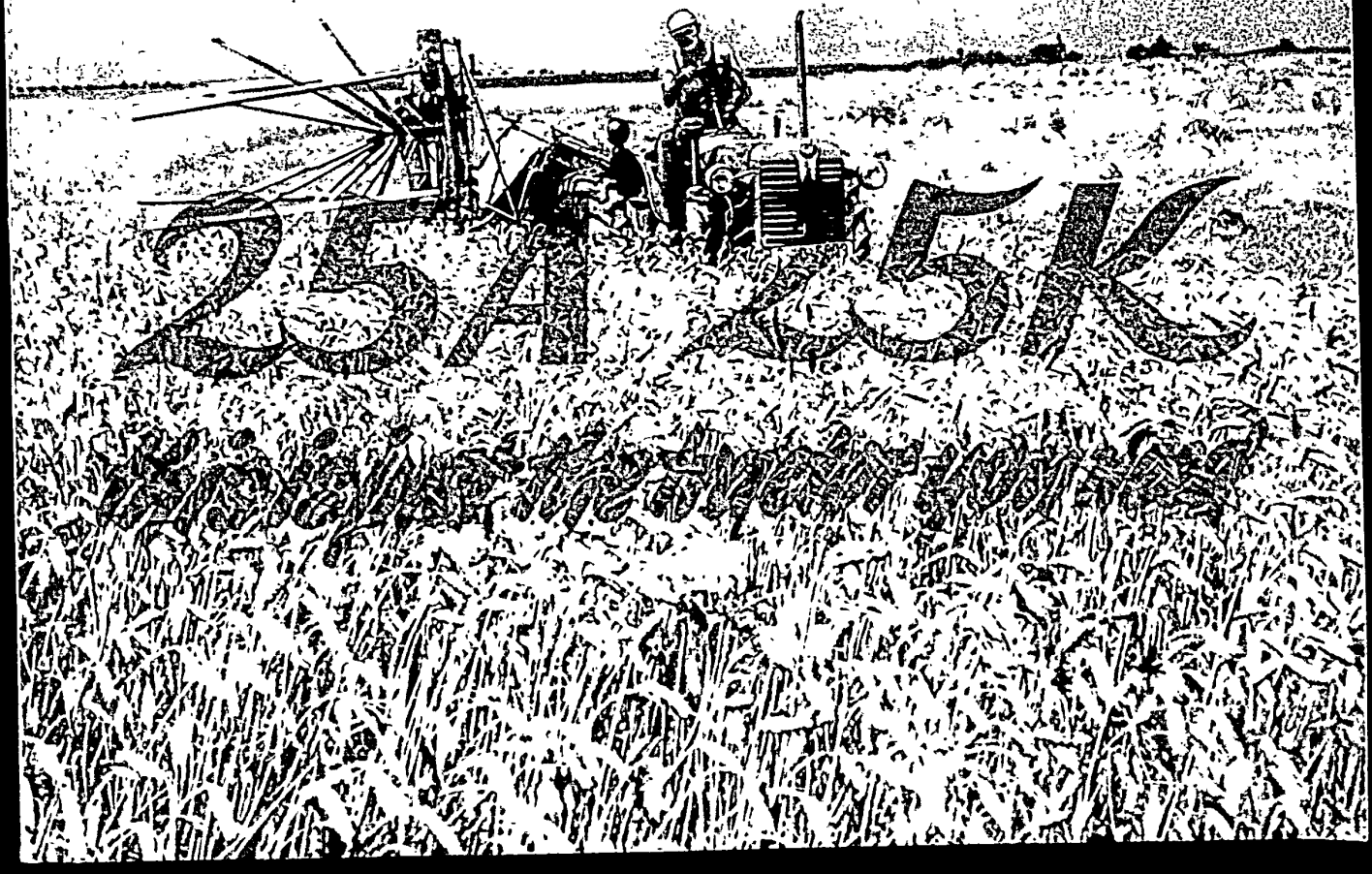
Zetor

Diesel



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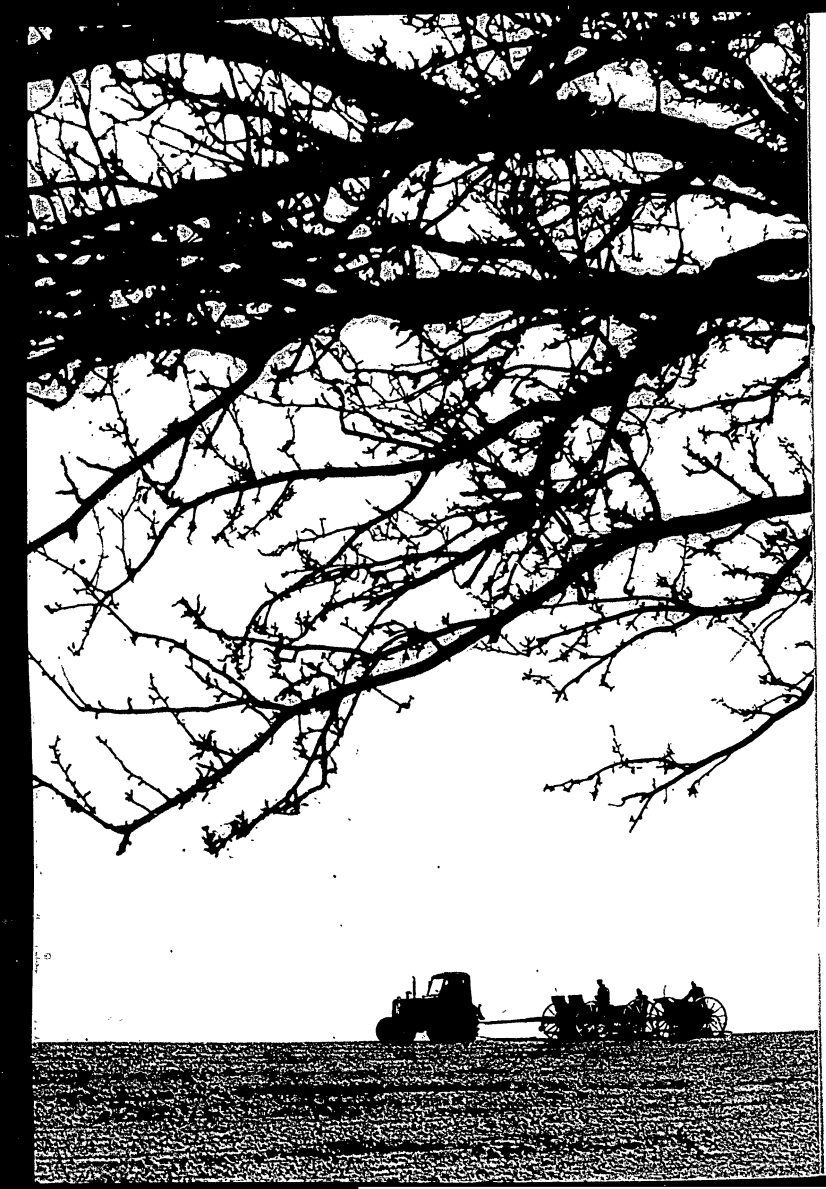
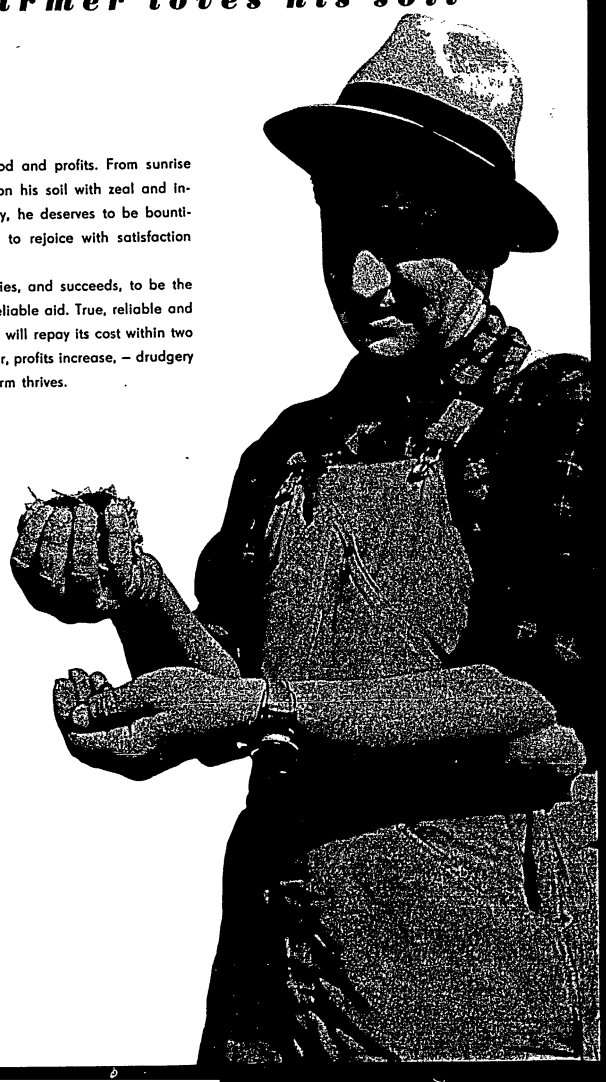


The farmer loves his soil

which gives him food and profits. From sunrise to sunset, he toils on his soil with zeal and industry. Consequently, he deserves to be bountifully rewarded and to rejoice with satisfaction over the rich crops.

The Zetor tractor tries, and succeeds, to be the farmer's true and reliable aid. True, reliable and unselfish. The Zetor will repay its cost within two years. With the Zetor, profits increase, – drudgery is cut – and the farm thrives.



Zetor
spells
prosperity

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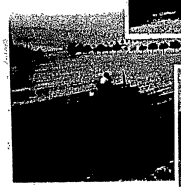
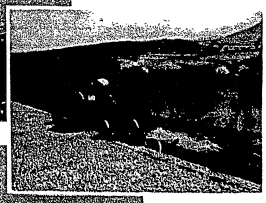
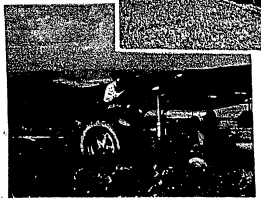
The Zetor is a tractor of all-round versatility. It will be found of great advantage everywhere:

- in farm work
- in transportation
- with stationary machines

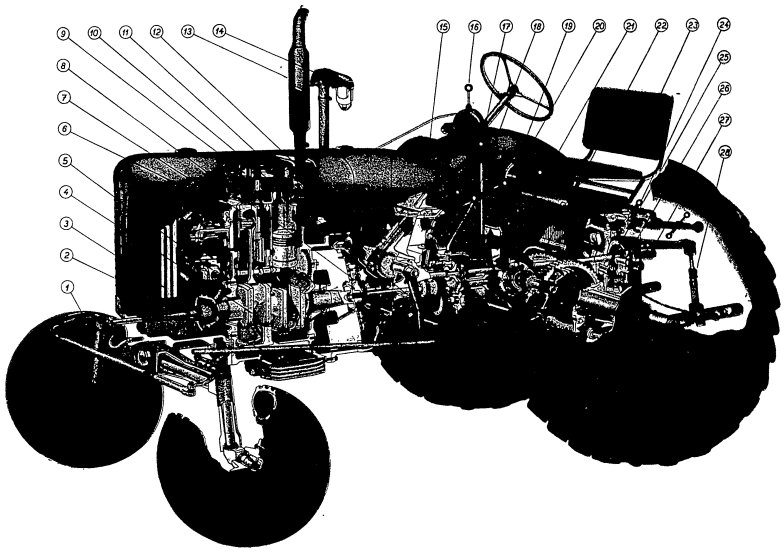






Zetor

Zetor Diesel



1 Adjustable front axle
2 Oil pump suction strainer
3 Radiator with thermostat and water pump
4 Crankshaft supported by three bearings
5 Speed governor and fuel pump
6 Decompression lever
7 Replaceable wet cylinder liners
8 Dry single-disc clutch
9 Overhead valve mechanism
10 Gearbox with six forward and two reverse speeds
11 Worm type steering
12 Starting motor
13 Exhaust pipe with silencer
14 Oil bath air cleaner with pre-cleaner
15 Instrument panel
16 Throttle lever
17 Differential lock lever
18 P. T. O. shift lever
19 Gearshift lever
20 Hand brake lever
21 Hydraulic lift control lever
22 Storage battery 12 V, 150 Ah
23 Cushion seat
24 Automatic clutch release
25 Hydraulic lift ram cylinder
26 Hydraulic lift gear-type oil pump drive
27 P. T. O. drive shaft
28 Three-point linkage mechanism for mounted implements

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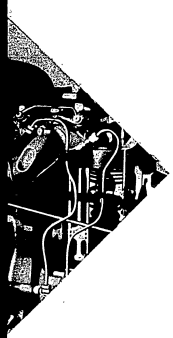


Why

has the Zetor a Diesel engine?

Because

1 a Diesel engine has a low fuel consumption,

2 the fuel – Diesel oil – is much cheaper than petrol or paraffine oil in any part of the world,

3 the routine maintenance of a tractor with Diesel engine is extremely simple,

4 a Diesel engine of equal swept volume (piston displacement) gives considerably higher output in comparison with any other internal combustion engine.

Service reliability

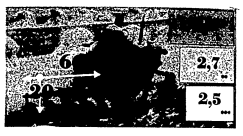
The time may come, as every farmer knows, when every day, every hour may be of the utmost importance. There is no spare time for repairs. These are the times when the Zetor can display its advantages:

Increased operating ratio (harvest time)
heavier working conditions of the tractor
Increased risk of failure
standard, reliable performance of the Zetor

Working efficiency

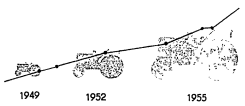
Furrow width of 60 cm or 23,622" at ploughing depth of 20 cm or 7,874". Daily output when ploughing in level terrain (10 hours)
Average fuel consumption under normal working conditions: 12 kg per 1 ha or 10 lbs per 1 acre.

* Light soil ha – 7,66 ac.
** Medium soil ha – 6,67 ac.
*** Heavy soil ha – 6,18 ac.



The farmer's favourite

Nowadays it is almost impossible to imagine an enterprising farmer not owning a tractor - a good tractor. Due to this fact, the popularity of the Zetor tractors is ever increasing.

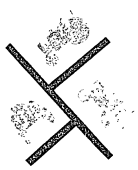


It can master any soil

The wheel diameter, the tractor weight, the tyre pattern – every single detail has been designed so as to enable the Zetor tractor to operate well in any terrain, whether sandy, stony, cloddy, or on tarmac, in woods or snow.

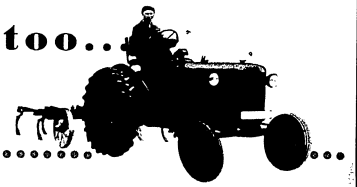
Perfect balance in any terrain

The design of the Zetor tractor as well as its weight (it is possible to increase the rear wheel weight by additional weights up to 140 kg or 308,65 lbs) guarantee its perfect balance in any position.



Maybe one of them is waiting

for you, too...



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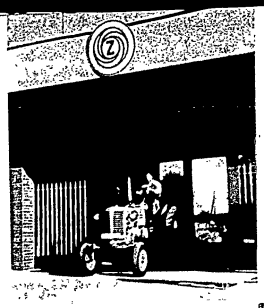
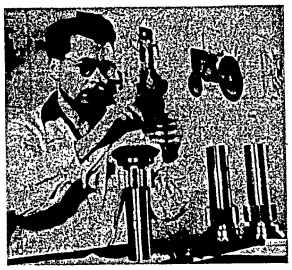
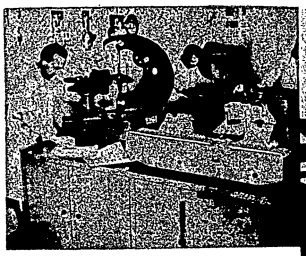


Zetor

But before leaving the factory gates

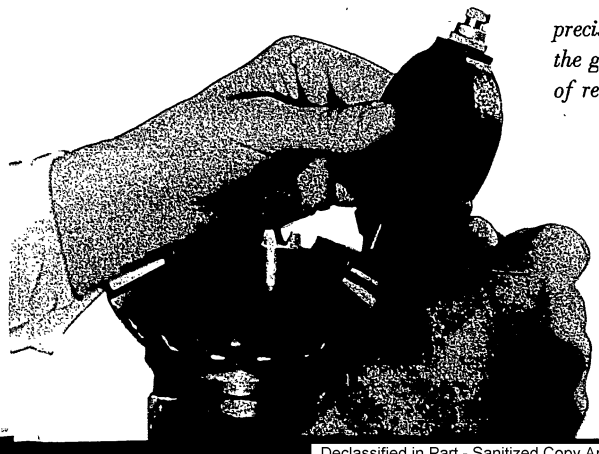
to serve faithfully –

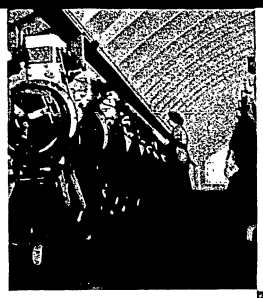




every one of its components is thoroughly tested, every individual manufacturing operation checked. The engineers have one motto:

precision testing — the guarantee of reliable operation



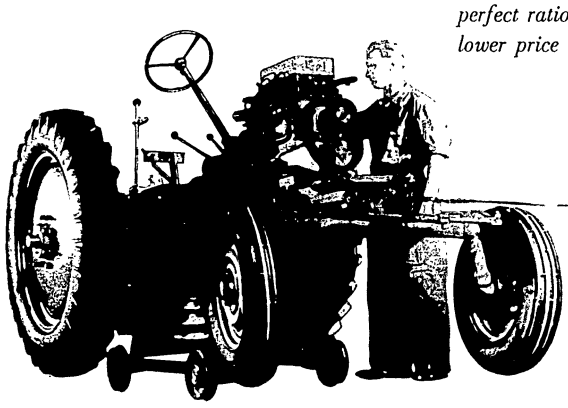


Zetor

All the manufacturing operations, carried out in well equipped, spacious halls, are perfectly rationalized, which fact also favourably influences the purchase price.

Here also, precision is of prime importance. The production has the motto:

perfect rationalization — lower price



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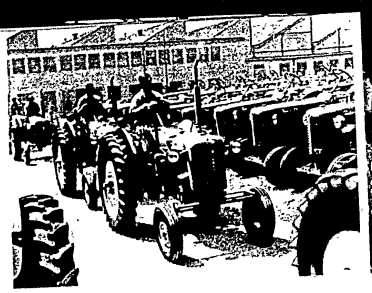
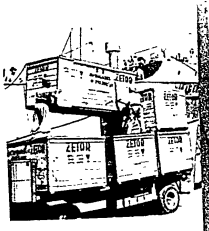
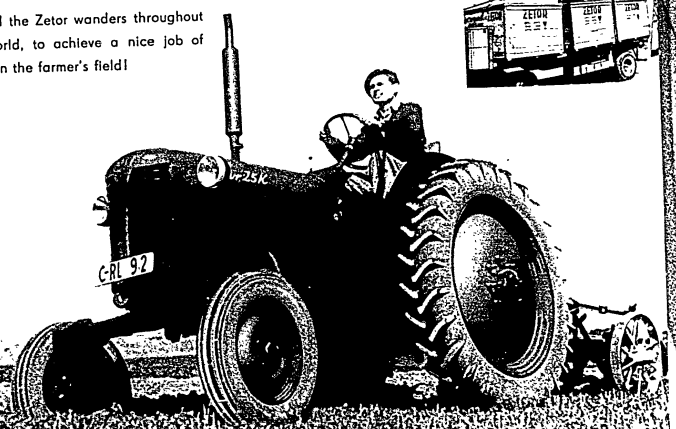


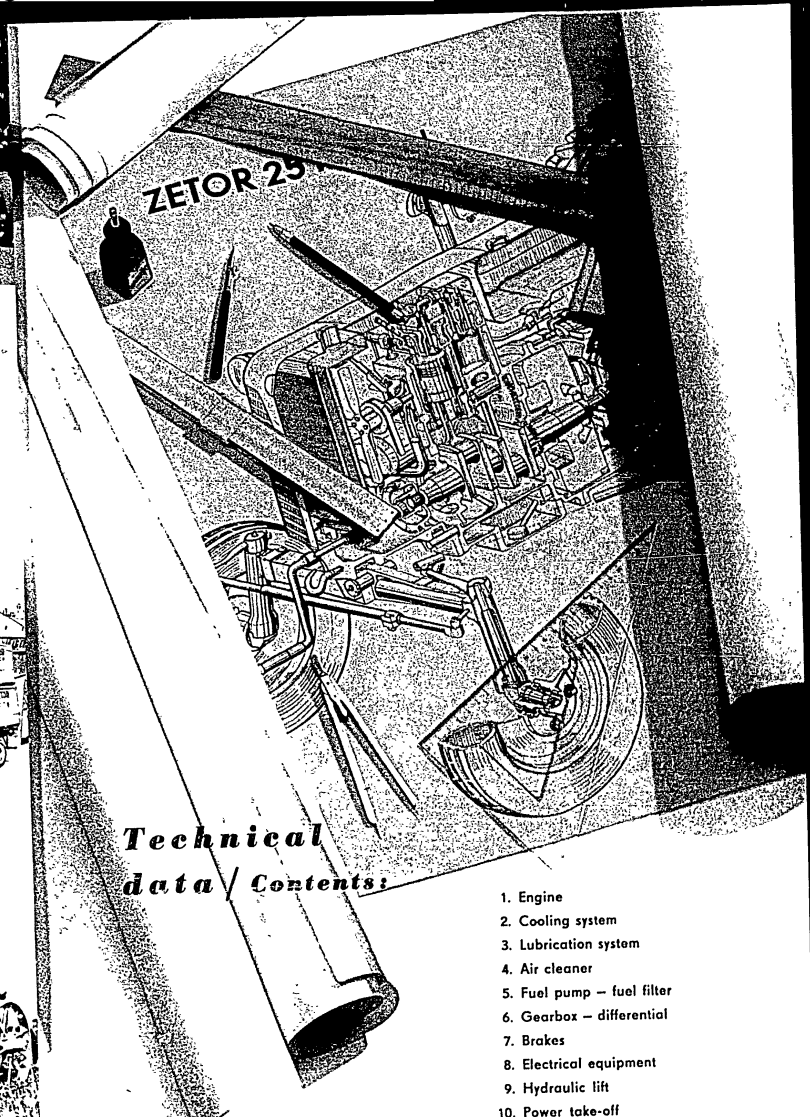
. . and then – a team of the Works' drivers •punish• the Zetor in the heaviest terrain.

And last but not least – careful packing, eliminating any possibility of damage even to the smallest component . . .



. . . and the Zetor wanders throughout the world, to achieve a nice job of work on the farmer's field!





Technical data / Contents:

1. Engine
2. Cooling system
3. Lubrication system
4. Air cleaner
5. Fuel pump – fuel filter
6. Gearbox – differential
7. Brakes
8. Electrical equipment
9. Hydraulic lift
10. Power take-off

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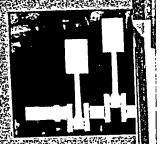
1. Engine

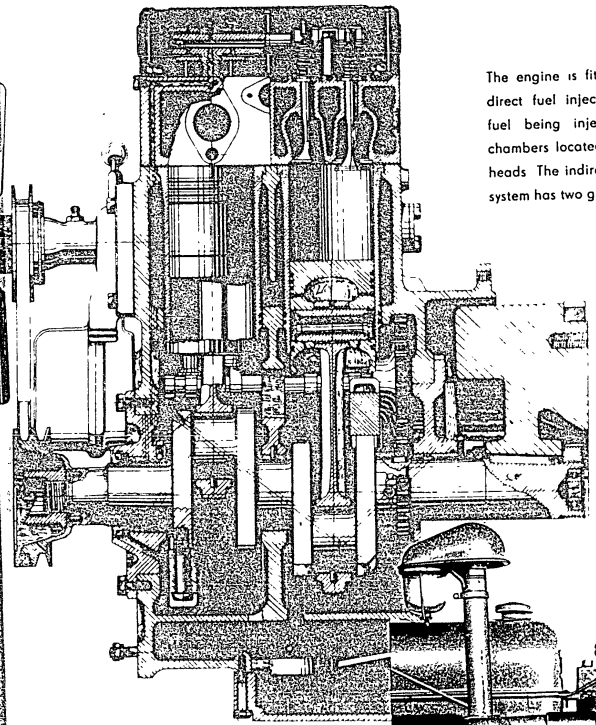
The Zetor engine is a four stroke, two cylinder, vertical Diesel engine.

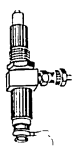


A high compression ratio (18 to 1) and engine speed enable a high output of the Zetor tractor at low dead weight.

The engine is fitted with an indirect fuel injection system, the fuel being injected into swirl chambers located in the cylinder heads. The indirect fuel injection system has two great advantages:

1. It enables operation of the tractor on any kind of pure Diesel oil,
2. single-hole injection nozzles can be used, which are much more durable than the multi-hole ones.





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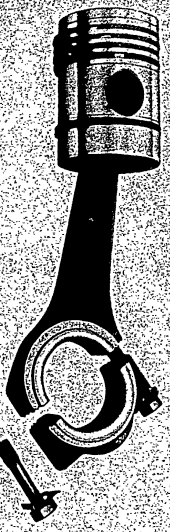
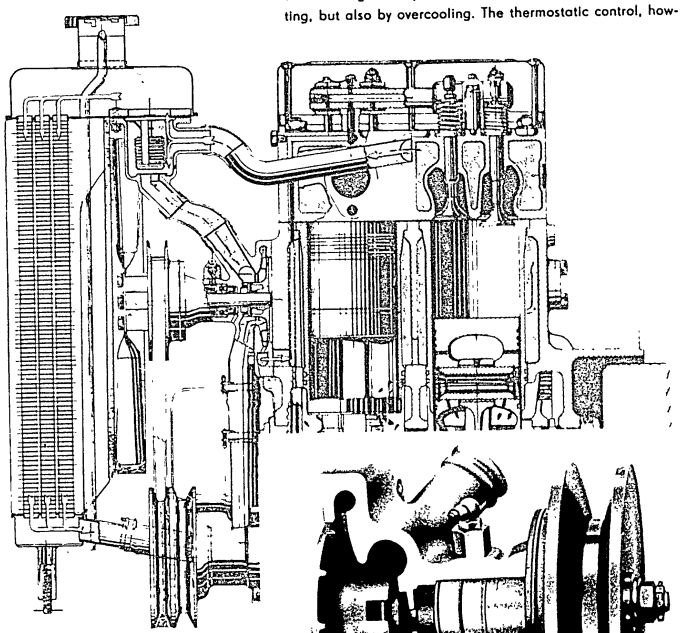
The engine is fitted with wet cylinder liners made of special heat-treated hard cast iron. The greatest advantage of the cylinder liners, however, is the possibility of frequent replacement which is very inexpensive in comparison with the price of the whole cylinder block.

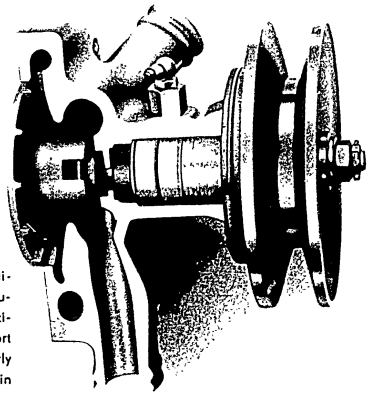
The part of the Diesel engine most subject to stress and strain is the crankshaft, and the design of the latter has really been brought by the Zetor designers to perfection. Hundreds and hundreds of tests have proven that the most suitable materials for the manufacture of crankshafts is nitraloy steel. Since the big end as well as the main bearings of the crankshaft are likewise heavily stressed, here also the best material hitherto available — lead bronze — has been used.



2. Cooling system

The engine cooling system consists of circulation water cooling with centrifugal pump and thermostatic temperature control with by-pass. Every competent tractor operator knows that the engine may be damaged not only due to overheating, but also by overcooling. The thermostatic control, however, controls the required working temperatures completely automatically, without any effort of the driver (particularly during starting and in cold weather).





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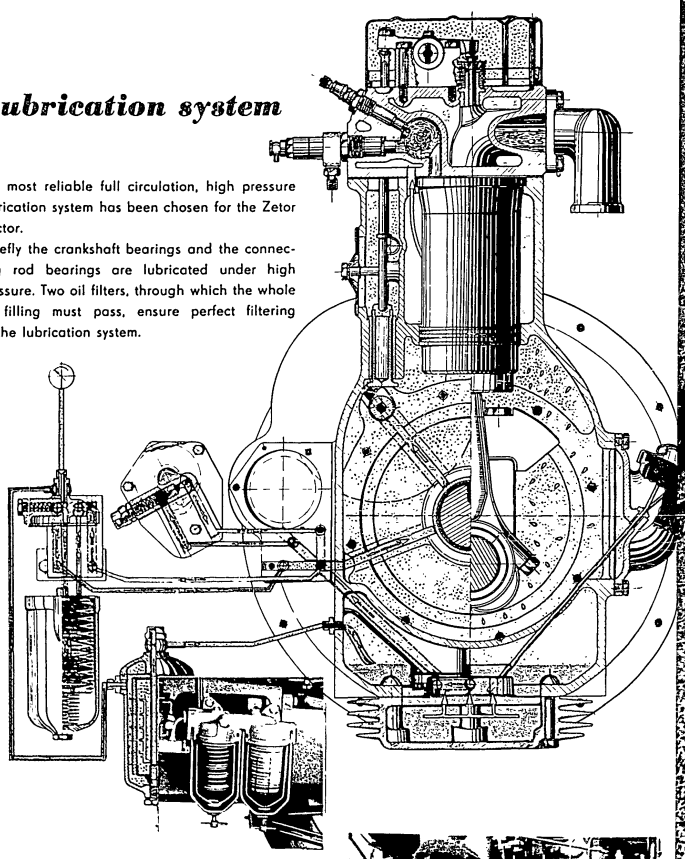
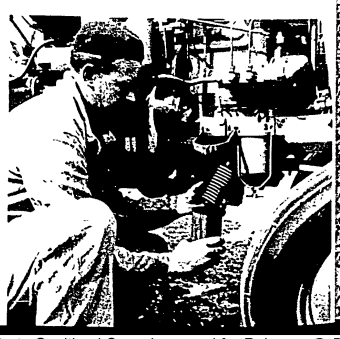
3. Lubrication system

The most reliable full circulation, high pressure lubrication system has been chosen for the Zetor tractor.
Chiefly the crankshaft bearings and the connecting rod bearings are lubricated under high pressure. Two oil filters, through which the whole oil filling must pass, ensure perfect filtering of the lubrication system.





Both oil filtres can be easily removed and cleaned. The oil pressure can be continuously checked on the dashboard.

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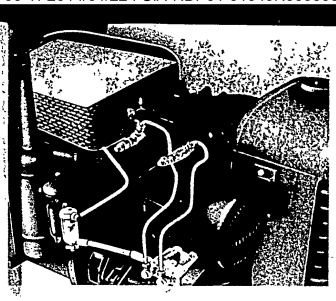
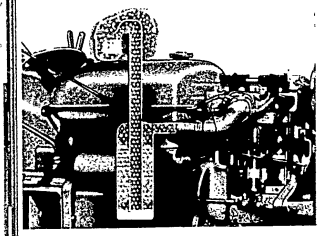


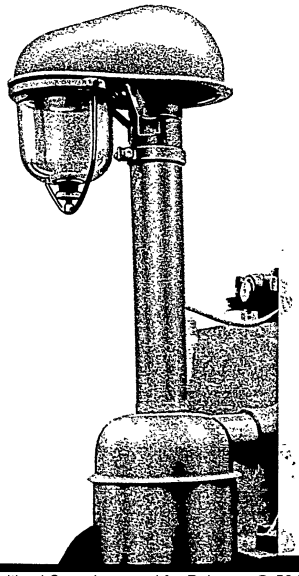
4. Air cleaner

Two reasons have compelled the Zetor designers to devote special attention to the air cleaner with special care:

1. The tractor must frequently operate under heavy working conditions in dust-laden areas.
2. The intake air capacity of a Diesel engine is much higher than that of a carburettor engine.

The air filter of the Zetor tractor is a two-stage filter. The intake pipe extension is located high above the engine bonnet where the air is comparatively the cleanest. The turbulating air passes through a glass bowl in which heavy dirt particles are trapped.

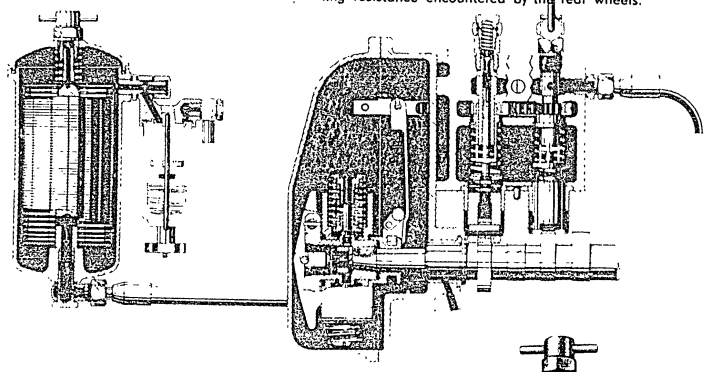




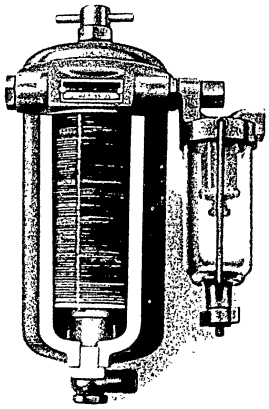
The main air filter is of the oil-bath type, the filter elements of which can be easily replaced.

5. Fuel injection pump - fuel filter

The fuel injection pump can develop a pressure of 240 kg/cm or 3430 psi, whereas the fuel injection valves are set to a pressure of 120 kg/cm or 1715 psi. The camshaft of the fuel injection pump bears a speed governor maintaining automatically the engine speed according to the rolling resistance encountered by the rear wheels.



Dirt is the sworn enemy of the tractor It causes premature wear of the injection pump plungers as well as the barrel walls – thus unnecessarily wasting the owner's money. But the Zetor wants to save it! For this purpose, it is fitted with a two-stage dual fuel filter. The first stage filter is the fuel pre-filter, i. e. a collector filter capturing heavy dirt particles, while the second stage filter, the fine filter, is fitted with an absorption filter cartridge which can be easily replaced



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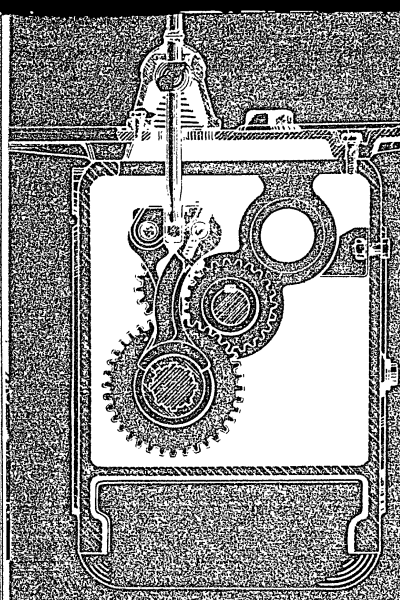
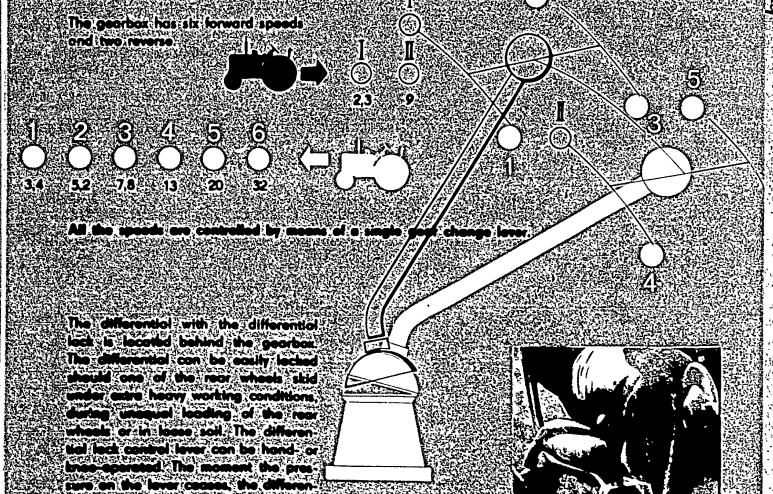


6. Gearbox - differential

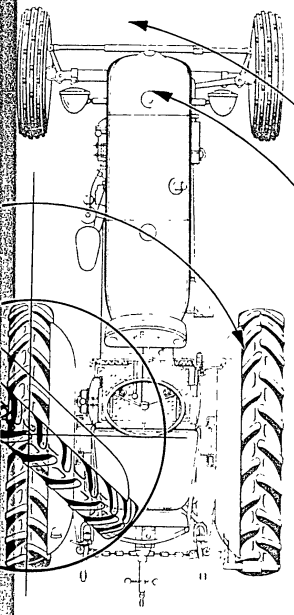
The Zetor Tractor being suitable for large choice of purposes, its gearbox has been designed according to these requirements. To enable full advantage to be taken of the efficiency of the tractor, the most suitable gear ratio for the respective operations can be selected. The advantageous stepping up of the gear ratios ensures operating economy — saving both fuel and time.

The gearbox has six forward speeds and two reverse



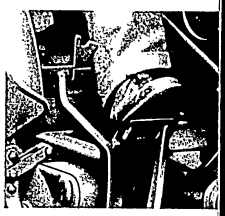
All the speeds are controlled by means of a single gear change lever.

The differential with the differential lock is located behind the gearbox. The differential can be easily locked should one of the rear wheels skid under extra heavy working conditions, during unequal loading of the rear wheels or in loose soil. The differential lock control lever can be hand- or knee-operated. The moment the pressure on the lever ceases, the differential is automatically put in operation.



7. Brakes

Since the Zetor operates not only in the field, but on highways as well, its brake system must correspond to the traffic regulations. The service brakes are of the internal expanding type.

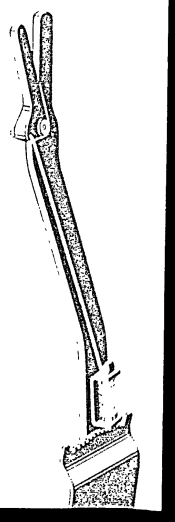


The foot brake has two pedals, thereby enabling individual brake application to the LH or RH rear wheel respectively. This arrangement will be found of great advantage, particularly when short turns are required, as the tractor can actually turn »on the spot«.

When driving on highways, both brake pedals can be latched together, thus enabling the rear wheels to be braked with equal intensity

In addition to the service brake, the Zetor is fitted with an external band-type hand brake

The pressure air system for trailers is supplied as special equipment



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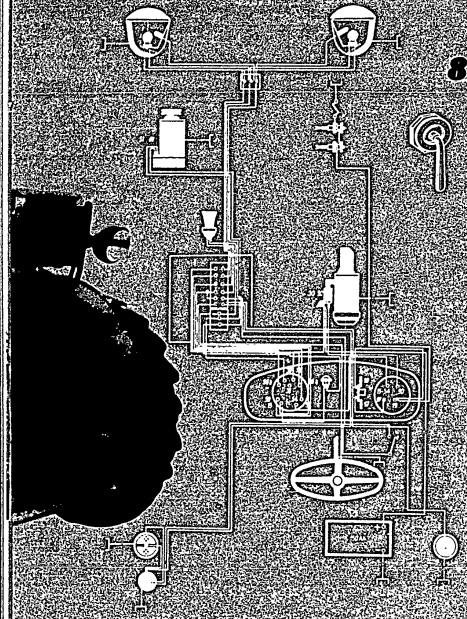
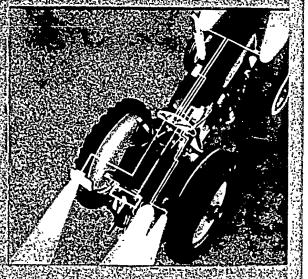


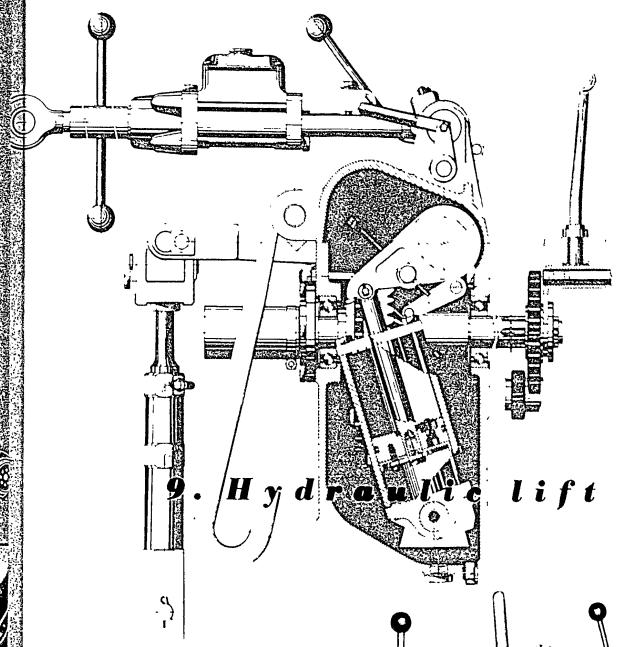
8. Electrical equipment

In addition to two headlamps, fitted with country beams, a dip light and parking (traffic) light, the Zetor can also be fitted with a rear searchlight for night work.
The electric current is supplied by the dynamo (generator) of 150 W output. The dynamo (generator) is of the fully enclosed type, is mounted on bearing bushes and needs no lubrication. The storage battery of 12 V, 150 Ah, enables easy starting even in cold weather. A tell-tale resistor located on the dashboard serves for checking the heater plug operation.

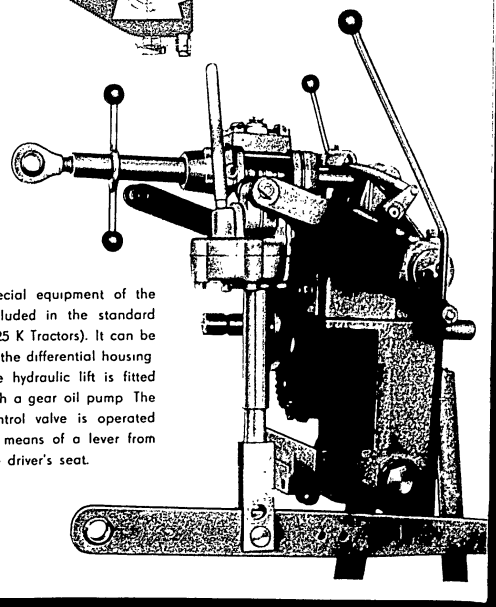
The dynamo (generator) is fitted with a built-in voltage and current regulator controlling automatically the charging and discharging of the battery.



The following devices complete the electrical equipment: an electric horn, a stop lamp, dashboard illumination, a battery charge warning light, a heater plug tell-tale light, a fuse box, a dip switch and a trailer socket.



9. Hydraulic lift



This is supplied as special equipment of the Zetor Tractor. (It is included in the standard equipment of the Zetor 25 K Tractors). It can be fixed to the rear side of the differential housing. The hydraulic lift is fitted with a gear oil pump. The control valve is operated by means of a lever from the driver's seat.

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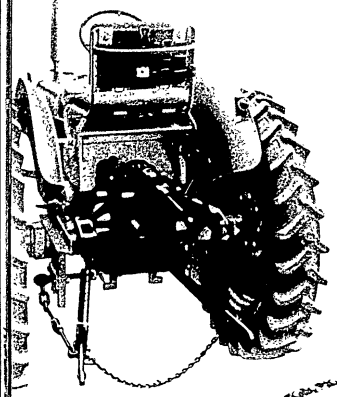
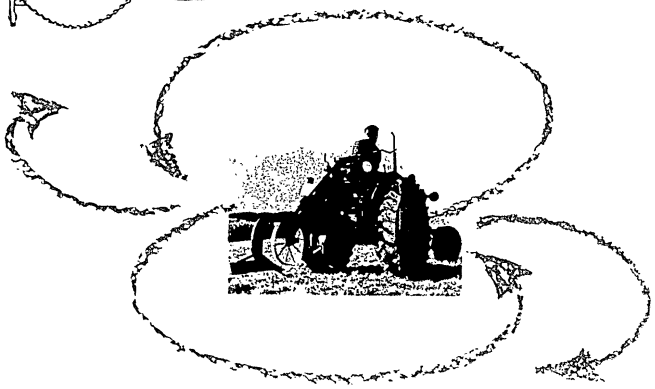


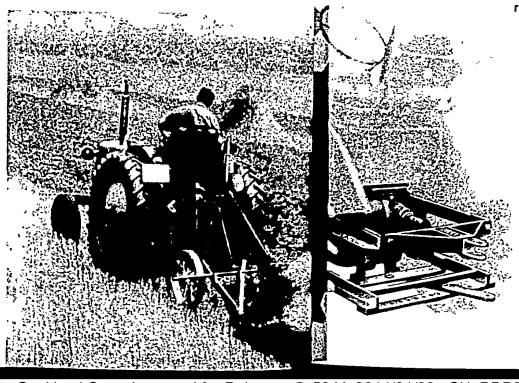
The end bolts bear the lifting arms, controlling the direct mounted implements by means of a system of tie-rods. The tie-rods are linked to the lifting arms by means of coupling heads, enabling the depth of ploughing to be adjusted.

The hydraulic lift has many advantages. Here are some of them:

- **speedy and simple transport of implements,**
- **the possibility of lifting or lowering the implements from the driver's seat without turning,**
- **the tractor c/w implements can easily reverse, take turns or freely travel from one field to another,**
- **the possibility of short turns -on the spot- with mounted implements.**

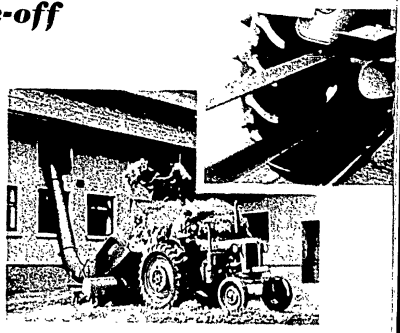


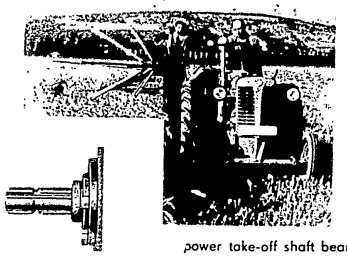
The amply sized control rod of the hydraulic lift is supplied complete with a hydraulic lock which immediately disengages the tractor clutch should the tractor encounter any obstacle in the terrain. Both the ploughing depth and width can be adjusted by controls, thus enabling the tractor operator to remain seated.



10. Power take-off

The small shifter lever located on the gear change cover is used for shifting the gear fitted to the power take-off shaft into mesh with the drive (main) shaft.



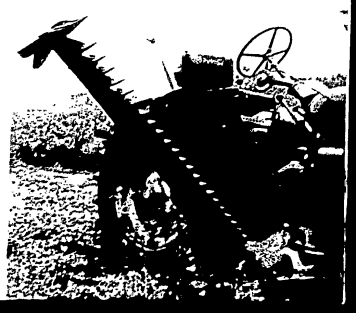


Belt pulley drive – the torque is transmitted from the power take-off shaft to the belt pulley by means of bevel gears. The gears are situated in a housing located at the rear of the gearbox housing.

Binder drive – the rear end of the power take-off shaft bears standardized splines for coupling of the binder. **Reel drive** – the front end of the power take-off shaft drives the bevel gears which in turn drive the detachable reel drive.

Lower attaching frame – to enable training implements to be attached, the tractor is fitted with a rear cross member (lower frame) with adjustable holes.

Tow-hook – the sprung tow-hook for attaching the trailer is located above the rear cross member (lower frame).



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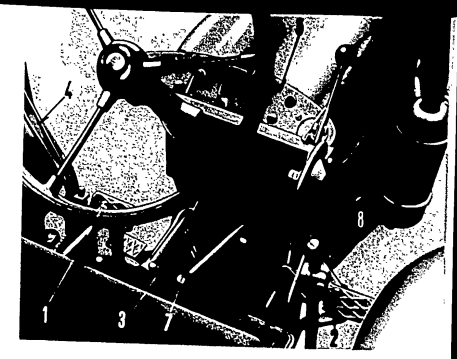
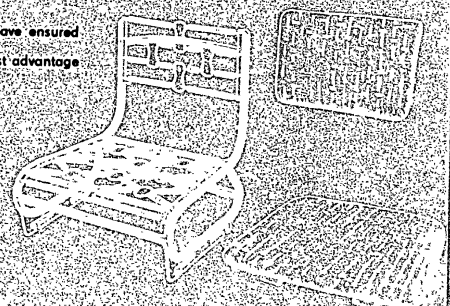
To ride on a tractor the whole day long is no easy job

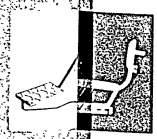


The operator, seated on a comfortably cushioned seat sprung by a system of springs, can control the steering, the clutch pedal, the foot brake pedal and the hand brake lever. He can read the instruments on the dash-board and after having started the engine, he can control its speed by means of the accelerator hand lever. After having stepped down the clutch pedal, he can shift noiselessly into the required gear by means of the gear change lever. Having put the gear change lever into neutral position, he can engage the power take-off shaft and the belt pulley drive by stepping down the clutch pedal and shifting the small control lever to the left and rearwards.

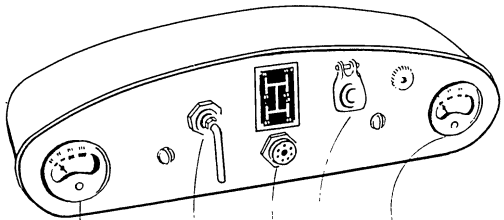
The designers of the Zetor tractor have ensured not only the possibility of the highest advantage to be taken of the tractor engine power, the driving eco-nomy, and its all-round versatility but they have also kept in mind the rising comfort of the operator and the simple routine maintenance of the tractor.



To enable easy mounting, the Zetor is fitted with a step on the LH side.



The seat can be moved forward and backward if necessary; it can be tilted to facilitate access to the storage battery.



- Oil pressure gauge
- Switchbox
- Heater plug pilot light
- Heater plug switch
- Cooling water temperature indicator

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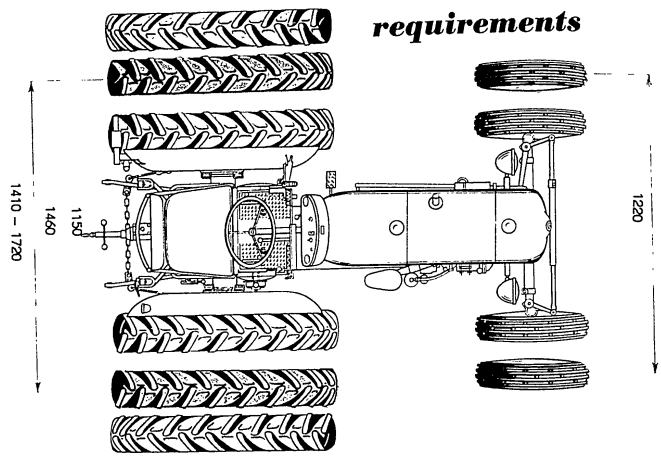
Every type of work has its special requirements



and the Zetor is extremely versatile Both the front wheel and the rear wheel tread are adjustable according to the various row-spacings of the respective row-crops.

Zetor 25 K – Row Crop Tractor:

Adjustable front wheel tread from 1220 up to 1540 mm or 48,0314 up to 59,6298"

Adjustable rear wheel tread from 1150 up to 1460 mm or 45,2755 up to 57,48".

By reverse mounting of the disc wheels, the tread is adjustable from 1410 up to 1720 mm or from 55,1117 up to 67,7164".

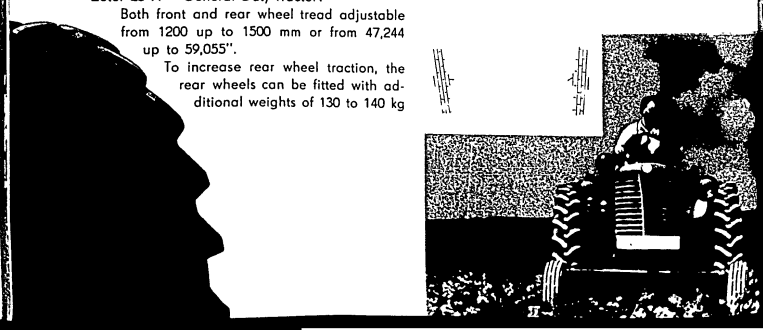
Zetor 25 A – General Duty Tractor:

Both front and rear wheel tread adjustable from 1200 up to 1500 mm or from 47,244 up to 59,055".

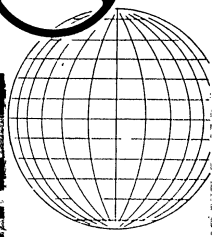
To increase rear wheel traction, the rear wheels can be fitted with additional weights of 130 to 140 kg or 286,60 to 308,65 lbs.

For special row-crop work, we supply the Zetor 25 K Diesel Tractor fitted with a high-type front axle of 550 mm or 21,6536" in height. This tractor has rear wheels of larger diameter, rear wheel tyres of smaller section and slightly different gearbox ratios (see technical data).

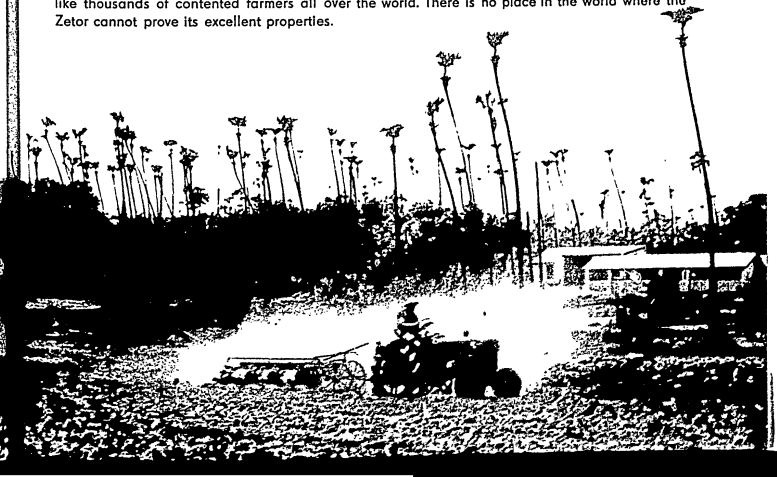
The Universal Farm-work Zetor Tractor is fitted with rear wheel tyres of field-work pattern enabling it to operate in any kind of terrain owing to their excellent traction properties and their preventing the accumulation of clay.



The sooner, the better



The sooner you too, order a Zetor, the better working results can you enjoy, like thousands of contented farmers all over the world. There is no place in the world where the Zetor cannot prove its excellent properties.



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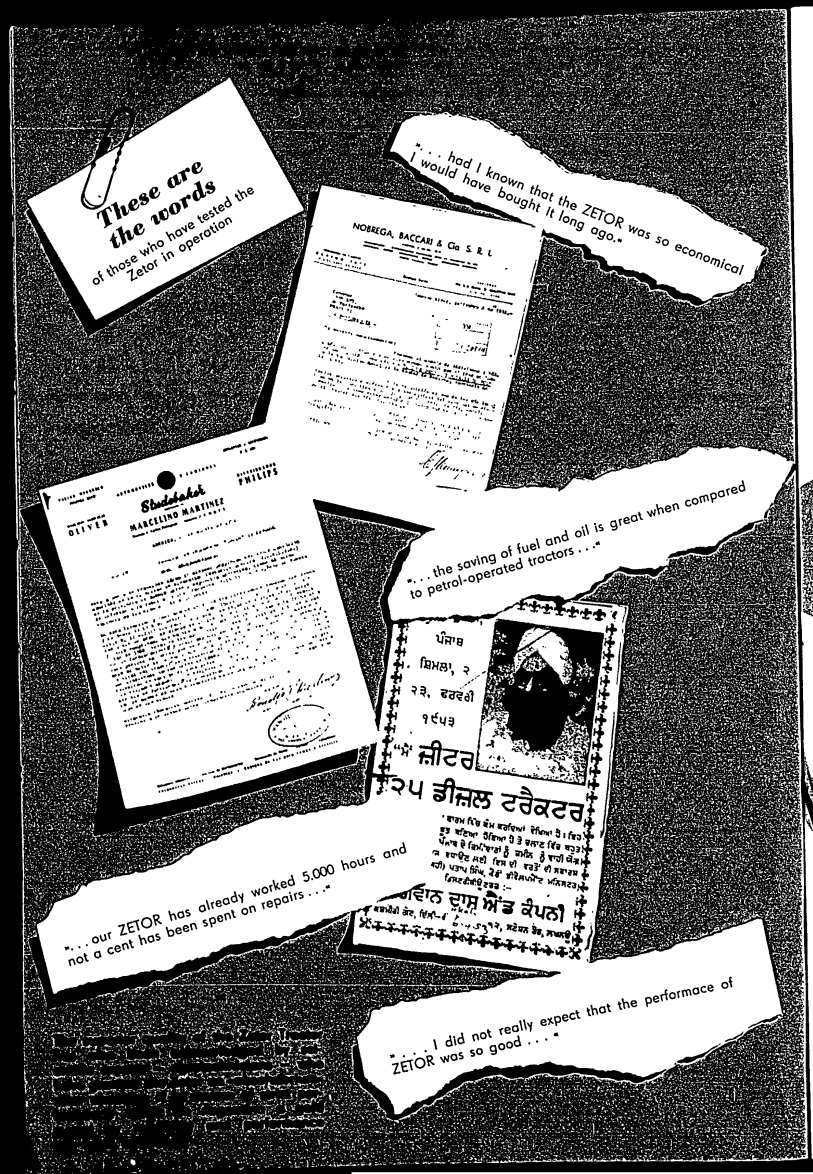
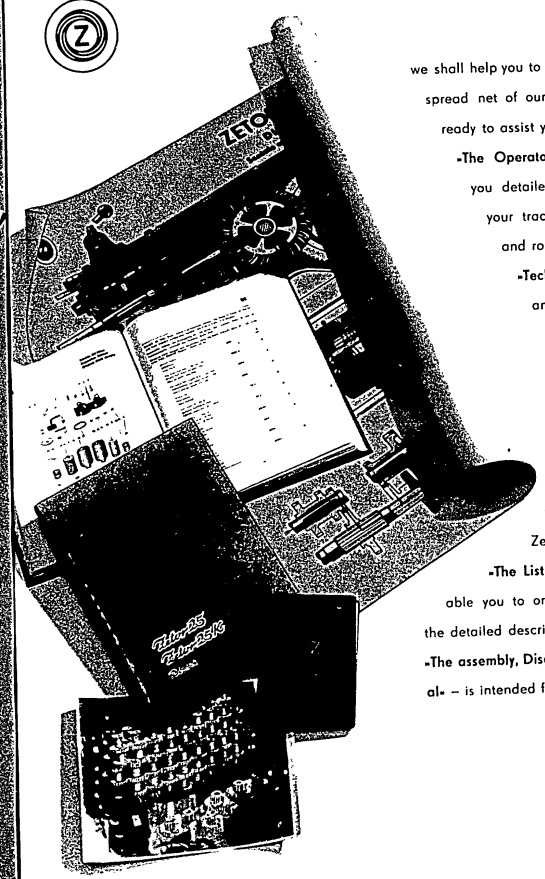


When you become the owner of a Zetor



we shall help you to take care of it The widespread net of our Service Stations will be ready to assist you

„The Operator's Manual" – will give you detailed information concerning your tractor, its driving technique and routine maintenance

„Technical inspections" – is another detailed brochure which will supply you with precise instructions as to when, which and how the respective Zetor components should be attended in order to keep the Zetor continuously fit

„The List of Spare Parts" – will enable you to order any part according to the detailed descriptions and drawings

„The assembly, Disassembly and Repair Manual" – is intended for repair shops

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Technical data:

	ZETOR 25 A	ZETOR 25 K
Bore	mm 105 | in 4,134	mm 105 | in 4,134
Stroke	120 | 4,7244	120 | 4,7244
Swept volume (displacement)	c. c. 2078 | cu. in. 122,536	c. c. 2078 | cu. in. 122,536
Compression ratio	18 to 1	18 to 1
Standard engine speed	1800 RPM	1600 RPM
Engine output at nominal speed	26 HP	24 HP
Specific fuel consumption	g/HP/h 220 | lb/HP/h 0,49	g/HP/h 220 | lb/HP/h 0,49
First speed	km. p. h 3,4 | m. p. h. 2,1	km. p. h. 3,8 | m. p. h. 2,39
Second speed	5,2 | 3,2	5,00 | 3,1
Third speed	7,8 | 4, 85	6,4 | 3,98
Fourth speed	11,00 | 8,08	10,6 | 6,7
Fifth speed	17,00 | 12,43	13,8 | 8,6
Sixth speed	25,6 | 19,9	18,00 | 11,185
First reverse speed	2,3 | 1,43	2,64 | 1,64
Second reverse speed	7,6 | 5,6	6,8 | 3,6
Front wheel tyres	5,50×16	5,50×16
Rear wheel tyres	11,25×24	9,00×36 13,00×28
Diameter of belt pulley	mm 250 | in 9,84	mm 250 | in 9,84
Belt pulley speed	990 RPM	880 RPM
Power take-off shaft speed	535 RPM	535 RPM
Storage battery	150 Ah	150 Ah
Weight less additional weights	kg 1985 | lbs 4276,98	kg 2040 | lbs 4189
Tracting power on hook, level road	1350 | 2645,5	1350 | 2645,5
Capacity of fuel tank	lit. 45 | Imp. gal 10	lit. 45 | Imp gal 10
Injection pressure	kg/cm² 125 | psi 1715	kg/cm² 125 | psi 1715
Transmission ratios:		
Ist speed	106,5 to 1	106 to 1
IInd speed	69 to 1	81,5 to 1
IIIrd speed	45,6 to 1	63,5 to 1
IVth speed	27,3 to 1	38,4 to 1
Vth speed	17,6 to 1	29,4 to 1
VIth speed	11,7 to 1	22,8 to 1
Ist reverse speed	155 to 1	155 to 1
IInd reverse speed	39,7 to 1	56 to 1
Differential ratio	38 to 7	38 to 7
Number of compression rings per piston	3	3
Number of scraper rings per piston	2	2
Wheelbase	mm 1900 | in 748	mm 1900 | in 748

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	ZETOR 25 A		ZETOR 25 K	
	mm	in	mm	in
Overall length	3200	125,98	3200	125,98
Overall width	1820	70,65	1965	70,65
Overall height up to steering wheel edge	1765	68,9	1910	75,2
Ground clearance under front axle	420	16,54	520	20,47
	m	ft	m	ft
Turning radius	5,8	16,4	5,8	21,33
Adjustable tread range:	mm	in	mm	in
front	1220 to 1540	47,24 to 59	1220 to 1540	48,03 to 59,6
rear	1200 to 1500	47,24 to 59	1150 to 1460	45,28 to 57,5 55,51 to 67,7
After reverse mounting of disc wheels	Impossible		1410 to 1720	
Overall height up to top edge of exhaust pipe	2060	80,32	2207	86,61
Possibility of fitting direct mounted side reel	Yes		Yes	
Possibility of fitting anti-skid wheels:				
front	Yes		Yes	
rear	Yes		No	
	kg	lbs	kg	lbs
Gross weight of additional weights	125	275,6	150	275,6

The Zetor tractors can be supplied with a complete range of both direct mounted and trailing implements, as well as with agricultural machines suitable for every type of farm work. The machines and implements listed below are those most frequently used and are suitable for any type of farm. These machines are well tested and proven, meeting all the requirements of farmers.

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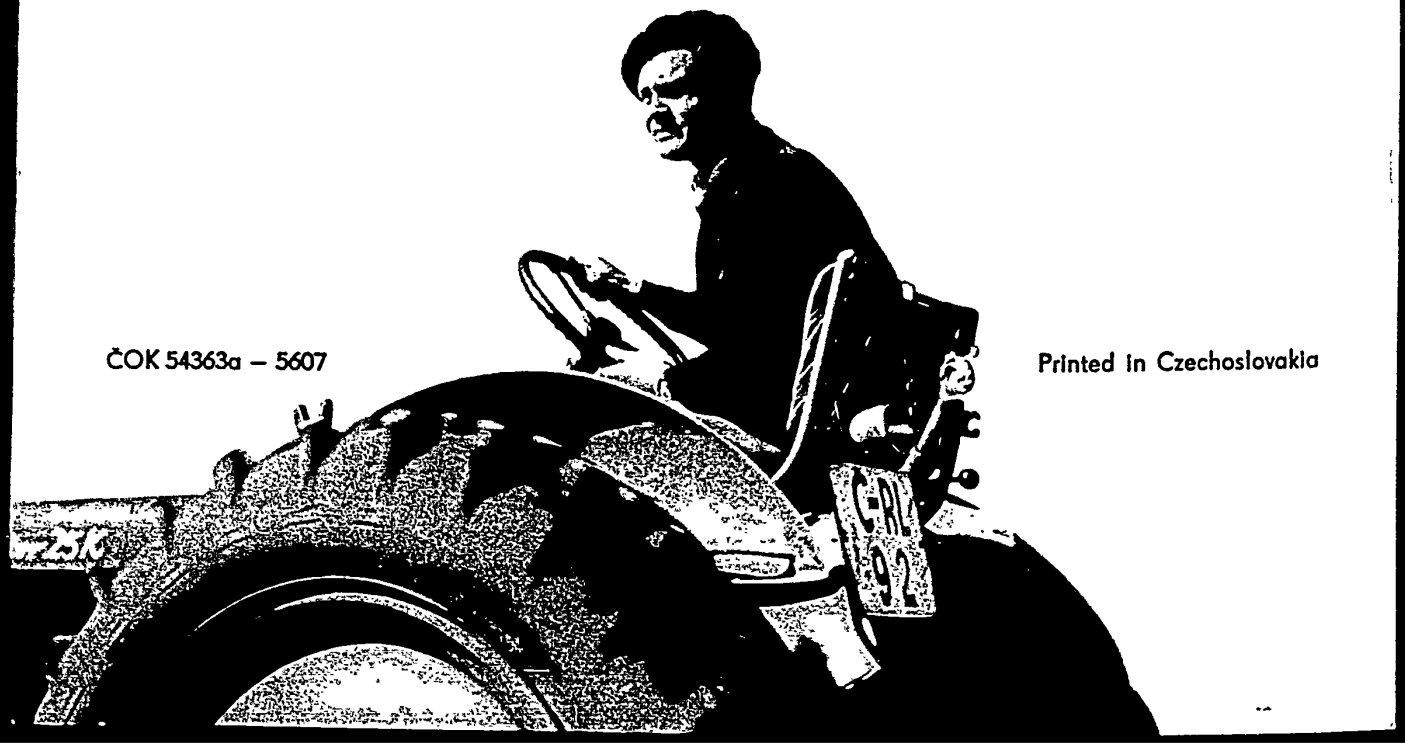

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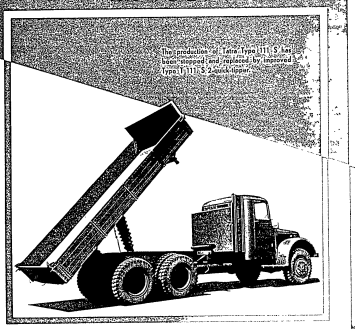
Tatra 111 S

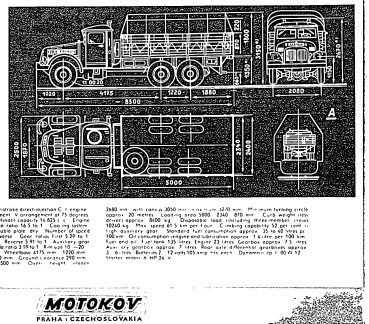


The production of the Tatra type 111 S has been stopped and replaced by improved Tatra 111 R S.Nord chassis.

This the largest heavy-duty truck of Czechoslovak make having a carrying capacity of 10 tons, was built in 1953 on the basis of many years of experience of the TATRA Works in building both commercial vehicles and passenger cars. It displays all the characteristic features which have gained the TATRA Works a world-wide reputation, namely the backbone and swinging half-axle with independent front and rear wheel suspension and a frameless chassis with a self-supporting central backbone tube. The vehicle is precision-made, designed for operation in the most difficult conditions and for the highest possible output. It is suitable both for upends long distance road transport and for off-road operation. It is available for right or left-hand drive control.

It ranges with flying colours among the other models of the renowned TATRA Works which during half a century have proven their outstanding position on every continent.

Tatra 111 R



SPECIFICATION

Engine TATRA 111 A Engine type OHV four-stroke direct-injection C. I. engine Number of cylinders 12 Cylinder arrangement V arrangement at 75 degrees, individual Bore alpha 110 120 mm Cylinder capacity 14 825 c. c. Engine power 180 HP at 1 800 r.p.m. Compression ratio 16 to 1 Maximum power 200 HP at 2 000 r.p.m. Maximum torque 600 kg.m. Number of forward speeds 5 Gear ratios 1st 6.96 to 1, 2nd 3.78 to 1, 3rd 2.05 to 1, 4th 1.11 to 1, 5th 0.60 to 1 Reverse 5.91 to 1 Auxiliary gear ratios Low 1.00, High 1.41 Transfer case ratios 1.00 and 1.41 Tyres 11.00—20, Super Cushion Wheelbase alpha 4 115 mm + 1320 mm Track Front 2000 mm, Rear (overcrop) 1850 mm Ground clearance 290 mm Overall length 8300 mm Overall width 2500 mm Overall height 2680 mm with cabin alpha 2850 mm with cabin beta 3210 mm Minimum turning circle approx. 20 metres Loading area 5000 2340 870 mm Curb weight (less diesel) approx. 8600 kg. Disposable load including three members' crew 10500 kg. Max. speed 75 km per hour. Climbing capability 32 per cent. Fuel consumption 35 litres per 100 km at 50 km per hour, 45 litres per 100 km at 75 km per hour. Oil consumption engine and lubricator approx. 1 litre per 100 km Fuel and oil Fuel tank 125 litres, Engine 23 litres, Gearbox approx. 7.5 litres Axle and steering gearing 7 litres Rear axle differential gearbox approx. 12 litres Battery 12 volts 105 Amp hrs each Dynamo 24 v 80 A 12 Starter motor 6 HP 24 v

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Tatra 111 R

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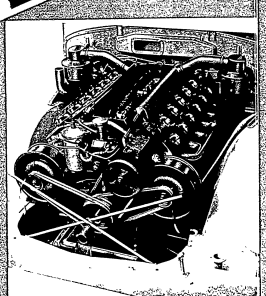
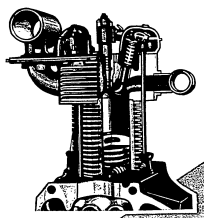
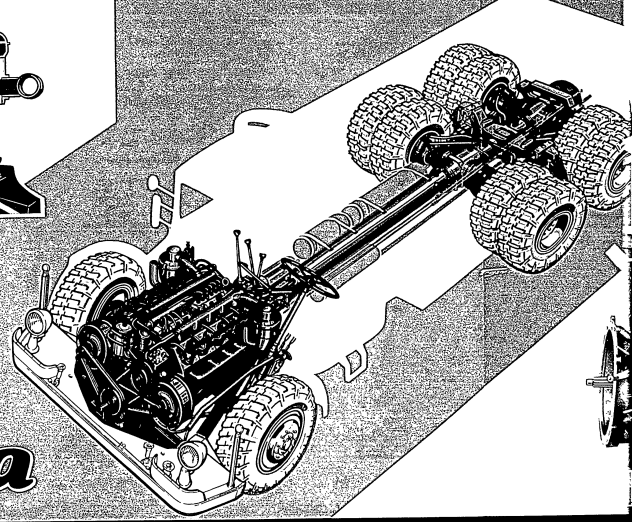
Tatra 111 R

TECHNICAL DESCRIPTION

The power plant consists of two vee-type generously finned cylinder units, each comprising, formed in two banks of 6 cylinders each. One alloy cylinder head, having overhead valves operated from two camshafts and pushrods, is fitted to each bank of cylinders. The single forged crankshaft is located between the cylinder banks, driving the aluminium alloy pistons by means of connecting rods fitted above the centre of the cast steel crankshaft bulkheads. Valves are operated from a camshaft located in the crankcase, which is fitted with a gear drive from the front end of the crankshaft. The camshaft is carried in three bearings. The oil reservoir for the sump, which is fitted on the left-hand side of the crankcase, forms the lubricant reservoir for the entire engine. The lubricant is circulated by a gear pump. A full-flow oil filter, which is fitted on the left-hand side of the engine, ensures that all the lubricant is thoroughly filtered every time it passes through the engine. Fuel is fed to the cylinders by means of two fuel injection pumps. Before entering the cylinders the fuel is passed through a special type felt cartridge filter to screen out dirt. The oil-wetted air cleaners are fitted on either side of engine. An air blower is fitted to either cylinder bank. Two air blowers (in total) force air via the baffle sheets to individual cylinders and their heads. Heated air is vented via engine bonnet vents. Fitted at the rear of the crankcase, RH. side, is the starter motor, with electromagnetic pinion engagement, while two dynamos are located in the cooling air blowers. A twin-cylinder air compressor is located on the front of the power plant to feed the air pressure braking system, being operated off the crankshaft by means of a V-belt. The power unit itself is flanged to the gearbox, which is of the constant double-plate 4+2 type with a device for uniform pressure distribution is built into the flywheel. The gearbox, with 4 forward speeds and one reverse, has coaxial mesh helical gears operated through dog clutches, flanged to the main gearbox is an auxiliary gearbox having one high (for highways) and one low (for cross-country work) gear ratio, with front axle propeller shaft in front and first rear axle propeller shaft at the rear; while a third propeller shaft connects the differential gearboxes at the two rear axles. Universal joints for the propeller shafts could be dispensed with owing to the particularly rigid tubular chassis backbone. All the bevel gears of either rear axle are carried in ball bearings. Special bucking plates are fitted to protect the crown wheels against deflections. Both rear axle differential gears are lockable from the operator's seat. All three drive axles have swinging half-axles, being carried in housings. A pair of V elliptic leaf springs, obliquely mounted and secured by two diagonal swinging bar struts is used for suspension of the front axle, the outer ends of which are fitted with constant velocity universal joints assuring uniform rotation of the front wheels on cornering. The front axle drive can be disengaged. Rear axles are provided with two longitudinal half-elliptic leaf springs balancing on edges. Either end of the spring is connected to the half-axle by means of yokes. Owing to the special TATRA designed rear wheel half-axle no universal joints are needed for the rear wheel drive. Pressed steel disc-type wheels, duplicated on either rear axle, are fastened by means of 10 bolts. The worm-and-peg steering runs in roller bearings. A foot-operated air pressure brake acts on all six wheels. Its mechanism consisting of a twin-cylinder air compressor, pressure equaliser, two compressed air bottles and a transfer valve. Also connected to the pressure line are a tyre inflator and air brake valve for the trailer. The hand brake is of an internal expanding transmission type, being operated mechanically.







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PRAGA V3S

QUICKTIPPER

Succesful mastering of transport on building sites requires a truck, that is economical and at the same time fully independant of weather and terrain. Such a truck is the new quicktipper Praga V3S.

Chassis and driving set are derived from the dropside-lorry V3S, on which the reliability and readiness was perfectly demonstrated even under most difficult operating conditions.

All-metal welded body with a capacity of 2.6 m^3 is mounted on a special reinforced frame, which does not disturb its elasticity, guaranteeing excellent terrain qualities of the truck. For the transport of light materials the capacity of bodywork can easily be increased up to 4.4 m^3 by means of wooden extensions. Hoisting of body is hydraulic by means of three-piston telescopic lift over a double-arm lever The designers succeeded by this design to keep a short, robust, hydraulic lift, reliable in operation and at the same time achieved high and quick tipping of body which is necessary for safe tilting of moisty and adhesive earth. The tilting device enables to lift the fully loaded platform up to maximum of 60° within 8 seconds only.

The tail-board opens automatically when tipping so that no extra hand is needed and the driver alone can cope with the operation. The whole working cycle of the tipper is very short and thus highly economical.

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PRAGA V3S

ASTONISHING PERFOMER ON BUILDING SITES

TECHNICAL DATA OF CHASSIS:

Frame	rectangular, riveted, combined
Main gearbox	four forward speeds, one reverse, selective form of gear changing
Gear ratios	I. 1 6.19, II. 1 3.13, III 1 1.75, IV 1 1, reverse gear 1 6.28
Auxiliary gearbox	two speeds, shifting by hand lever
	gear ratios a) 1 0.75
	b) 1 2.15
Axles	3 rigid driving axles, front drive to switch off
Steering	globodial worm with roller, sprung steering rod
Springs	longitudinal, semielliptical
Shock absorbers	hydraulic, double-acting
Brakes	foot operated pressure air brake acting on all wheels
	hand operated mechanical brake, acting on intermediate shaft
Tyres	8.25—20 HD terrain profile
Disc wheels	7"—20 flat
Clutch	dry single plate
Min. turning radius	10,5 m
Top speed	62 km/h
Climbing ability without trailer	77 %
Standard fuel consumption	27 L/100 km
Fuel tank capacity	120 L
Max. tipping angle	60°
Cargo platform capacity	2.6 m³—4.4 m³
Tipping time	8 sec

- Expedient design
- Output — low fuel consumption — economy
- Easy control
- Edsy handling of quick tipper-body tilting
- Cabin with comfortable seats
- Efficient heating and ventilation of cabin
- Excellent terrain qualities

TECHNICAL DATA OF ENGINE:

Engine	T 912, Diesel-engine, four stroke, with direct injection
Number of cylinders	6 in line
Bore and stroke	110/130 mm
Swept volume	7412 cm³
Compression ratio	1 16.6
Max. output	98 HP at 2100 RPM
Max. torque	38 kgm/1200 RPM
Cooling	air cooling
Lubricating system	forced circulation dry crankcase

WEIGHT DATA:

Payload	4650 kg
Weight of service ready vehicle	5780 kg
Max. total weight	10430 kg
Axle pressure of loaded truck front axle	2310 kg
rear axle	8120 kg

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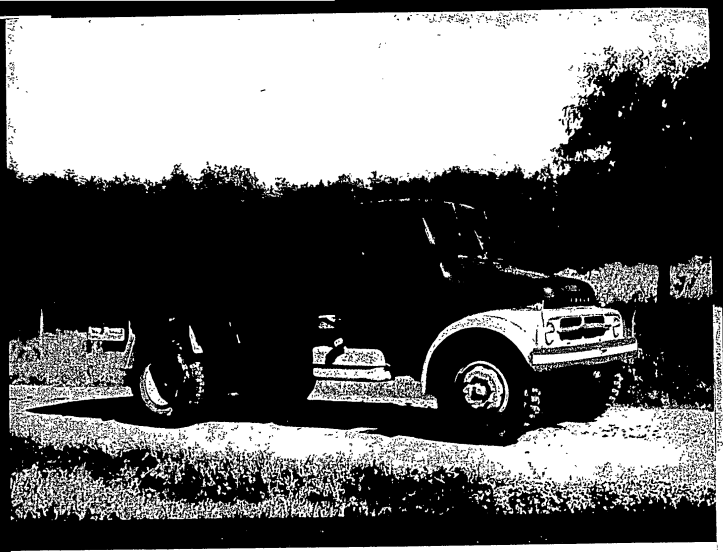

PRAGA S5T

DROPSIDE LORRY

For the combined automobile long distance and local transport there appears to be most successful the category of 5 ton trucks, which at comparatively low operating costs secures a large transport capacity A successful representative of this class is the new dropside lorry Praga S 5 T

The well proved engine T 912 together with the technically elaborated chassis guarantee a permanent operating without defects. Outstanding is the high traction power of the truck On the roads with the climbing angle up to 15% the fully loaded truck can pull a trailer with total weight of 7 5 tons Thus practically a double carrying capacity is achieved, which very efficiently reduces the costs per tonkilometer

The main gearbox with four forward and one reverse speed is completed by a reduction gearbox, which reduces the main gear ratios twice The large extent of gear ratios together with differential lock and a favourable distribution of weights on both axles affords the vehicle an exceptional passing ability even on roads seldom used for automobile transport Shifting of both reduction gear and differential lock proceeds electropneumatically by means of a push button Both is indicated by light indicators The pneumatic device for tilting of spare wheel, located under the platform of the truck, makes the tiring exchange of defective wheel easy The driver's cab is equipped with two comfortable seats for driver and fellow-driver and a third auxiliary seat. Efficient heating and ventilation, perfect location of control and checking device and good all round vision reduce fatigue of the driver on long distances

REPRESENTATIVE:

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PRAGA S5T

A TRUCK OF UNIVERSAL USE

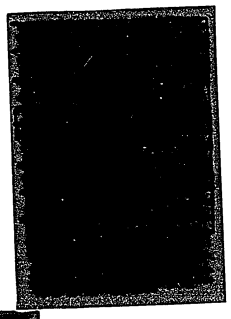
- Smart appearance
- Output — low fuel consumption — economy
- Easy control
- Electro-pneumatic control of reduction gear and differential lock shifting
- Cabin equipped with comfortable seats
- Efficient heating and ventilation of driver's cabin
- Pneumatic tipping of spare wheel

TECHNICAL DATA OF ENGINE

Engine	T 912, Diesel engine, four-stroke, with direct injection
Number of cylinders	6 in line
Bore/stroke	110/130 mm
Swept volume	7412 cm³
Compression ratio	1 16.6
Max. torque	38 kgm/1200 RPM
Max. output	98 HP at 2100 RPM
Cooling	air cooling
Lubricating system	forced circulation, dry crankcase

TECHNICAL DATA OF CHASSIS

Frame	rectangular, riveted
Main gearbox	four forward speeds, one reverse selective system of gear changing
Gearbox ratios I. 1 6.19, II. 1 : 3.13, III 1 : 1.75, IV. 1 . 1, reverse speed 1 6.28	
Auxiliary gearbox	two speeds, electro-pneumatic shifting gear ratios a) 1 . 0.73 b) 1 : 0.96
Axles	rigid
Driven rear axle	
Steering	globoidal worm with roller, sprung steering rod
Springs	longitudinal, semielliptical
Shock-absorbers	hydraulic, double-acting
Brakes	foot operated pressure air brake, acting on all wheels hand operated mechanical brake, acting on rear wheels hand operated engine brake
Tyres	9.00—20 eHD, rear axle—twin disc wheel 7.00—20
Discwheels	dry, single plate
Clutch	8 m
Min. turning radius	72 km/h
Top speed	30 %
Climbing ability without trailer	18 l/100 km
Standard fuel consumption	120 l
Fuel tank capacity	



TRUCK—DIMENSIONS

WEIGHT DATA

Payload	5200 kg
Weight of service ready vehicle	4560 kg
Max. total weight of truck	9760 kg
Axle pressure of loaded truck	
front axle	2430 kg
rear axle	7330 kg
Weight of chassis with cabin	4040 kg
Total weight of trailer up to 15 % climbing	7500 kg

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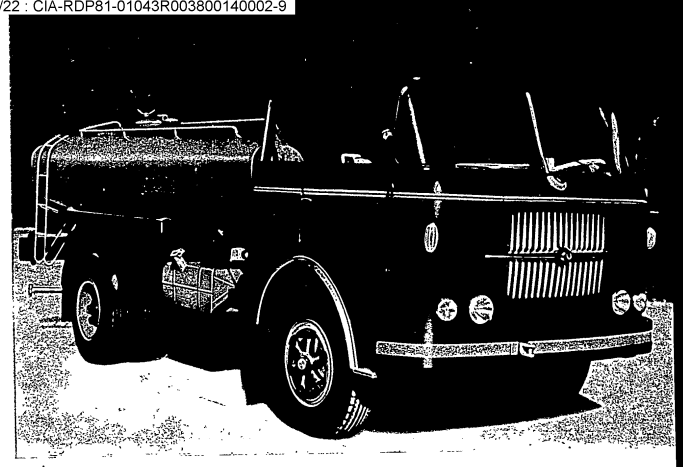

ŠKODA RT AKV

UNIVERSAL SPRINKLER-TANKER

The universal sprinkler-tanker is the result of many years'development and experiences gained from earlier models of sprinkler-tankers In this model the formerly produced road spraying and city spraying vehicle is combined.
The universal sprinkler-tanker is fitted to a Škoda 706 RT trambus chassis The whole body, i. e. the tank, the pump, the pump drive from the gearbox of the chassis, the sprinkling and control attachment, forming one unit, is elastically mounted on the chassis and is very easily detachable.
The universal sprinkler-tanker is designed for spraying of city streets and roads, for washing of paved, concrete and bituminous roads and for spraying at construction and maintenance of gravel roads. The sprinkling is enabled by controllable sprinkler bodies, arranged along the flanks of the vehicle and a sprayer nozzle, located under the rear part of the tank. Washing and spraying is carried out by means of an adjustable washing bar, mounted at the rear of the vehicle
At the rear of the tank, above the pump, an open cab is fitted housing control attachment of sprinkler bodies and washing bar and one seat for the operator
The universal sprinkler-tanker may be attended by two persons, i. e. the driver and a trained carman as attendance of sprinkling and washing attachment. The extent of sprinkling is easily surveyable and controllable from the operator's stand.
The universal sprinkler-tanker enables by means of its equipment the following operations

a) Sprinkling by means of side closable sprinkler bodies with the rear sprayer nozzle, or sprinkling only by the rear sprayer nozzle without side sprinkler bodies
b) Washing by means of main washing bar, which is adjustable on both sides.
c) Spraying by means of adjusted main washing bar.

The universal sprinkler-tanker has an independent inlet duct from the pump with a fixed connector B 75 for connecting of fire fighting hoses. Thus it may be used as a tanker with an abundant source of water at fire fighting on accessible spots without a water source. In the same way it may be used for sanitation purposes.

REPRESENTATIVE:
DETAILED INFORMATION AT AGENCIES IN ALL COUNTRIES OR AT

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ŠKODA 706 RT AKV

UNIVERSAL SPRINKLER-TANKER

BASIC TECHNICAL DATA

Chassis:

Engine	Škoda 706 RT
Engine type	four-stroke, Diesel OHV, direct injection, vertical, in-line
Number of cylinders	6
Bore	dia. 125 mm
Stroke	160 mm
Capacity	11781 c. c.
Power output	160 at 1900 r. p. m.
Compression ratio	16,5
Cooling	water-cooling, with forced circulation and thermal regulation
Clutch	air-operated, dry, two-disc
Gear shifting	5 forward, 1 reverse
Maximum speed	75 km/h
Operating speed	55—60 km/h
Fuel consumption	26,5 litres per 100 km
Oil consumption	0,8 litres per 100 km

Bodywork:

Tank capacity	7000 litres
Weight of vehicle with full tank	15000 kg
Maximum sprinkling extent	15 m
Maximum washing extent	2,5 m

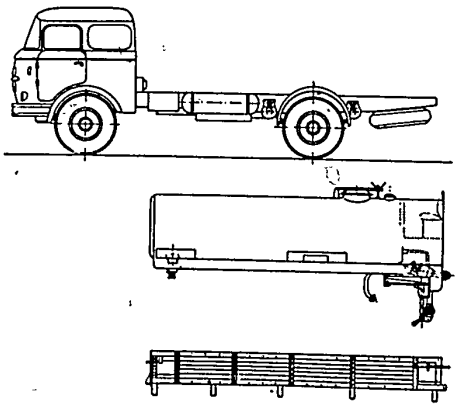
Dimensions of the vehicle:

Overall length	7650 mm
Overall width	2400 mm
Overall hight	2500 mm

Water pump specifications:

Nominal water flow	l/min.	1000	600	500
at man. delivery head	m	80	120	80
and geodetic suction head	m	1,5		7,5
Maximum permissible pump pressure	m w. c.	140		
Maximum vacuum within one min.	m w. c.	8		
Permissible vacuum drop per min.	m. w. c.	1		
Number of delivery heads 75		1		
Number of intake heads 110		1		

EXCHANGE OF BODYWORK — Exchange of different kinds of body enables perfect use of the chassis that with the present type of body remained unexploited.



- Škoda 706 RT chassis provided by special drive adjusted to a quick and easy exchange of below mentioned kinds of body
- For a sprinkler-tanker sprinkler body — tank with pump and sprinkling attachment.
- For a truck body for normal transport of loads.

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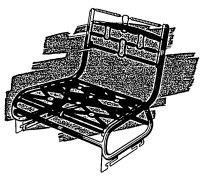
- **Two accelerators,** a hand-operated accelerator lever and a foot-operated accelerator pedal, are among the further features of the ZETOR tractor. It is possible to make use of either of these accelerators according to the kind of job to be done.
- **Exceptionally easy starting** of the engine, even under the coldest weather conditions, is made possible by using a heavy-duty 4 H. P. starter motor and special heater plugs. A special device is assembled on the ZETOR SUPER to increase the injected doses of fuel when starting.
- **By means of a decompression lever** which is operated from the driver's seat it is possible to decrease the compression in the cylinders to the minimum this contributing very effectively to easier starting of the tractor engine.
- **On special request** all three types of ZETOR tractor can be equipped with a pressure air braking system which ensures also safe braking of trailers being hitched behind the tractor. The importance of this attachment is clearly evident also from the fact that it has recently been prescribed as a necessary precaution in the local safety regulations in some European countries.

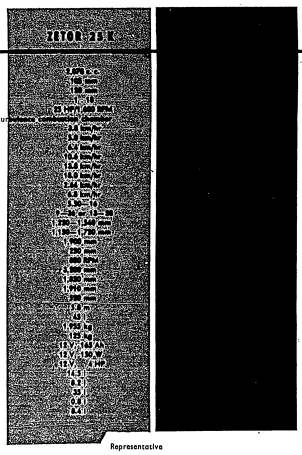


- **A small air compressor** which is driven from the crankshaft by means of timing gears can also be delivered on special order. It can be used for feeding the pressure air brake system, for tube inflating, etc.
- **A double seat** can also be delivered in the latest production series on special request.
- **In addition to the complete** electrical equipment the ZETOR tractor can be equipped on special request with a rear-mounted headlamp for night ploughing.
- **The high transport speed** of the ZETOR 25 A tractor (about 28 km/H) as well as perfect stability of the machine predestines this type of tractor also for quick transport jobs.
- **All three types** of ZETOR tractors are fitted both with a top-mounted coupling hook, e. g. for hitching trailers, and a lower situated swinging drawbar, i. e. a laterally as well as vertically adjustable bracket for hitching drawn implements. All types of farm machinery can, therefore, be hitched behind a tractor which is provided with the above mentioned mechanisms.
- **The hydraulic power lift** can be equipped, on request, with a special overload release device which disengages the engine clutch and thus stops the tractor, should the mounted implement meet an obstruction such as stone, rock, etc.
- **All levers for controlling the individual mechanisms** of the tractor are advantageously situated near the driver's seat.
- **The dashboard** is fitted with the necessary checking equipment: an oil pressure gauge, a water temperature indicator, an ammeter (on request), a heater plug and starter switch, a heater plug pilot resistor, an enclosed contact socket for the switch box key, a charging pilot light, a gear shift diagram and, if a pressure air brake system is delivered, a pressure gauge.

As we are constantly improving and developing the construction and design of the ZETOR tractors, all specifications and illustrations in this pamphlet are subject to alteration without notice.

SPECIFICATIONS

	ZETOR 25 A	ZETOR 25 K
Swept volume	2,078 c. c.	2,078 c. c.
Bore	105 mm	105 mm
Stroke	120 mm	120 mm
Compression ratio	1 : 18	1 : 18
Power output	26 HP/1,800 RPM	28 HP/1,800 RPM
Injection system	Indirect injection through turbulence chamber	Indirect injection through turbulence chamber
Ist speed	3.7 km/hr	3.7 km/hr
IInd speed	5.7 km/hr	5.7 km/hr
IIIrd speed	8.6 km/hr	8.6 km/hr
IVth speed	12.1 km/hr	12.1 km/hr
Vth speed	16.8 km/hr	16.8 km/hr
VIth speed	27.3 km/hr	27.3 km/hr
Ist reverse speed	2.3 km/hr	2.3 km/hr
IInd reverse speed	7.6 km/hr	7.6 km/hr
Front tyre size	5.50—16	5.50—16
Rear tyre size	11.25—24	11.25—24
Front wheel axle width, adjustable	1,200—1,340 mm	1,200—1,340 mm
Rear wheel axle width, adjustable	1,200—1,500 mm	1,200—1,500 mm
Wheelbase	1,900 mm	1,900 mm
Belt pulley diameter	250 mm	250 mm
Belt pulley speed	990 RPM	990 RPM
Maximum length of tractor	3,200 mm	3,200 mm
Maximum width of tractor	1,820 mm	1,820 mm
Height (up to steering wheel)	1,770 mm	1,770 mm
Ground clearance under front axle	420 mm	420 mm
Minimum turning diameter	5.8 m	5.8 m
Fuel tank capacity	45 l	45 l
Weight in operating condition	1,825 kg	1,955 kg
Rear additional weight	125 kg	125 kg
Storage battery	12 V, 165 Ah	12 V, 165 Ah
D. C. generator (dynamo)	12 V, 150 W	12 V, 150 W
Starter motor	12 V, 4 HP	12 V, 4 HP
Water filling	14.5 l	14.5 l
Oil filling in engine housing	8.2 l	8.2 l
Oil filling in gearbox	35 l	35 l
Direct drive housing	0.8 l	0.8 l
Hydraulic power lift housing	8.4 l	8.4 l



Representative

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SPECIFICATIONS

	ZETOR 25 A	ZETOR 25 K
Swept volume	2,078 c. c.	2,078 c. c.
Bore	105 mm	105 mm
Stroke	120 mm	120 mm
Compression ratio	1 : 15	1 : 15
Power output	25 HP/1,800 RPM	25 HP/1,800 RPM
Injection system	Indirect injection through turbulence combustion chamber	
Ist speed	3.7 km/hr	3.8 km/hr
IInd speed	5.7 km/hr	5.9 km/hr
IIIrd speed	8.6 km/hr	8.9 km/hr
IVth speed	12.1 km/hr	12.6 km/hr
Vth speed	18.8 km/hr	18.8 km/hr
VIth speed	27.3 km/hr	28.9 km/hr
Ist reverse speed	2.3 km/hr	2.44 km/hr
IInd reverse speed	7.6 km/hr	6.8 km/hr
Front tyre size	5.50—16	5.50—16
Rear tyre size	11.25—24	9.5—32 / 11.25—24
Front-wheel axle width, adjustable	1,200—1,560 mm	1,200—1,560 mm
Rear wheel axle width, adjustable	1,200—1,500 mm	1,150—1,770 mm
Wheelbase	1,900 mm	1,900 mm
Belt pulley diameter	250 mm	250 mm
Belt pulley speed	990 RPM	600 RPM
Maximum length of tractor	3,200 mm	3,200 mm
Maximum width of tractor	1,820 mm	1,820 mm
Height (up to steering wheel)	1,770 mm	1,910 mm
Ground clearance under front axle	420 mm	390 mm
Minimum turning diameter	5.8 m	5.8 m
Fuel tank capacity	45 l	45 l
Weight in operating condition	1,826 kg	1,955 kg
Rear additional weight	125 kg	125 kg
Storage battery	12 V, 165 Ah	12 V, 165 Ah
D. C. generator (dynamo)	12 V, 150 W	12 V, 150 W
Starter motor	12 V, 4 HP	12 V, 4 HP
Water filling	14.5 l	14.5 l
Oil filling in engine housing	8.2 l	8.2 l
Oil filling in gearbox	35 l	35 l
Direct drive housing	0.8 l	0.8 l
Hydraulic power lift housing	8.4 l	8.4 l

Representative

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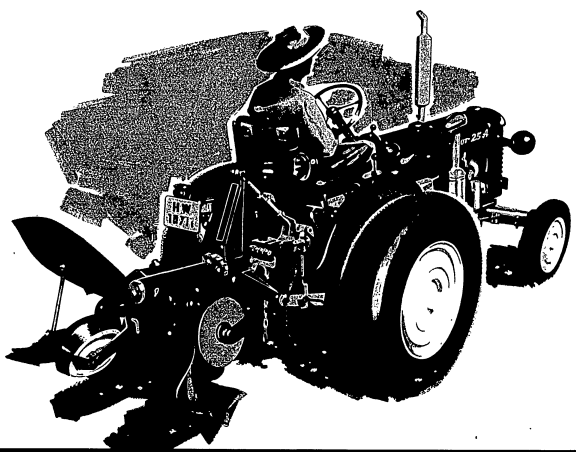
purpose exploitation of the tractor. The ratio between the power output and the tractor weight is so ideal that it makes possible the most economical and, simultaneously, even the maximum exploitation of the machine. The tyres are very advantageously selected as well: the front tyre size is 5.50–16, whereas the rear tyres with open farm tread have a size of 11.25—24. The complete electrical equipment of this tractor type consists of the following components: D. C. generator (dynamo) with voltage regulator, a storage battery, an electric starter motor, heater plugs, horn, headlamps, tail lights and complete control equipment.



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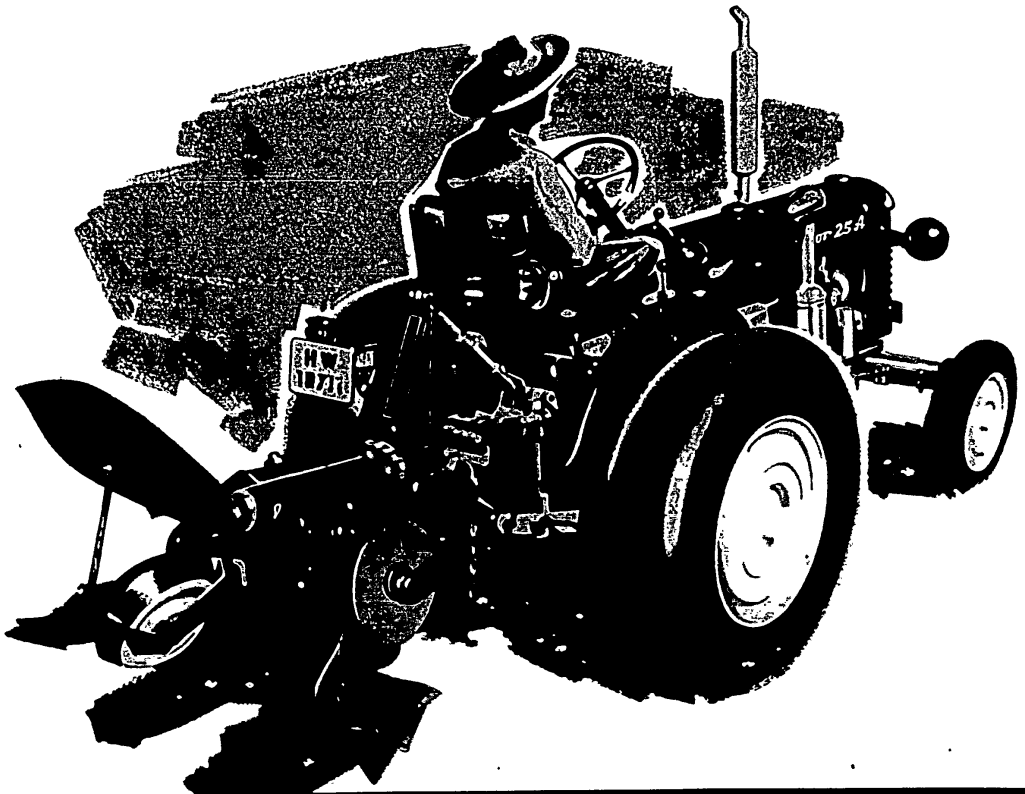
ZETOR TRACTOR - THE SYMBOL OF GOOD WORK, HIGH OUTPUT AND LONG LIFE

In consequence of the development and rapid pace of mechanization of farm jobs [illegible] the tractor has ceased to be only a drawing machine and has become, in its up-to-date design, a general purpose assistant of every farmer. Nowadays the farmer is no longer satisfied with the possibility of performing, by means of his tractor, regular operations which are connected with seed-bed preparation and soil cultivation; on the contrary, he demands for far-reaching adaptability of his tractor to all jobs which have to be done on the farm. The ZETOR tractor represents undoubtedly such a type of tractor which can boast not only of its versatility, but also of further advantages such as high power output, economy in consumption of fuel and lubricants, sturdy design ensuring its resistance even under the most unfavourable conditions as well as long life in comparison with other types of tractors, remarkable manoeuvrability combined with perfect exploitation of the tractor for transport purposes, the stability and technical design of the tractor enabling it to operate perfectly and reliably even in the tropics and in the polar regions as well. These are the basic properties which make the ZETOR tractor one of the most popular types and its good name is already connected with high quality and successful farm work practically in all larger agricultural countries of the world. The ZETOR tractors really belong among the biggest successes of the Czechoslovak farm machinery industry.
We are nowadays manufacturing three types of ZETOR tractors, i. e. the ZETOR 25 A, the ZETOR 25 K and the ZETOR SUPER Diesel tractor.

Zetor 25 A

The ZETOR 25 A tractor with a power output of 26 H. P. is provided with a four-stroke, two-cylinder Diesel engine (stroke 120 mm, bore 105 mm) with indirect fuel injection through the turbulence combustion chamber. This design is characterized by good fuel combustion and is less pretentious regarding the quality of Diesel oil. The forced feed circulation lubrication using a gear pump is applied in the case of this tractor model. The water cooling system with a centrifugal pump and a thermostat which automatically maintains the correct operating temperature is supplemented also with a radiator screen which can be rolled up, if necessary, from the driver's seat and makes it possible, above all in the cold winter period, to warm up the engine very quickly and to maintain the optimum temperature. A centrifugal speed and output governor controls the number of engine revolutions in the fuel range, i. e. from idle run up to the maximum speed. In order to enable the tractor to operate even in sandy and dusty areas, it is equipped with two-stage filters for cleaning oil, fuel and air. Six forward and two reverse speeds guarantee general-purpose exploitation of the tractor at the most varied speeds required. Also the mutual relation between the power output and the tractor weight is so ideal that it makes possible the most economical and, simultaneously, even the maximum exploitation of the machine. The tyres are very advantageously selected as well: the front tyre size is 5.50–16, whereas the rear tyres with open farm tread have a size of 11.25—24. The complete electrical equipment of this tractor type consists of the following components: D. C. generator (dynamo) with voltage regulator, a storage battery, an electric starter motor, heater plugs, horn, headlamps, tail lights and complete control equipment.



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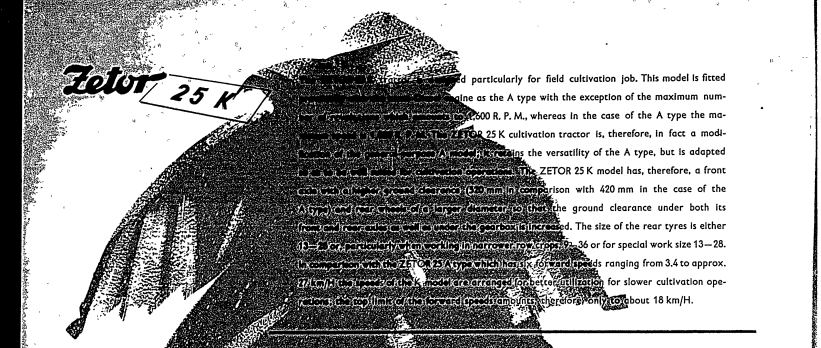
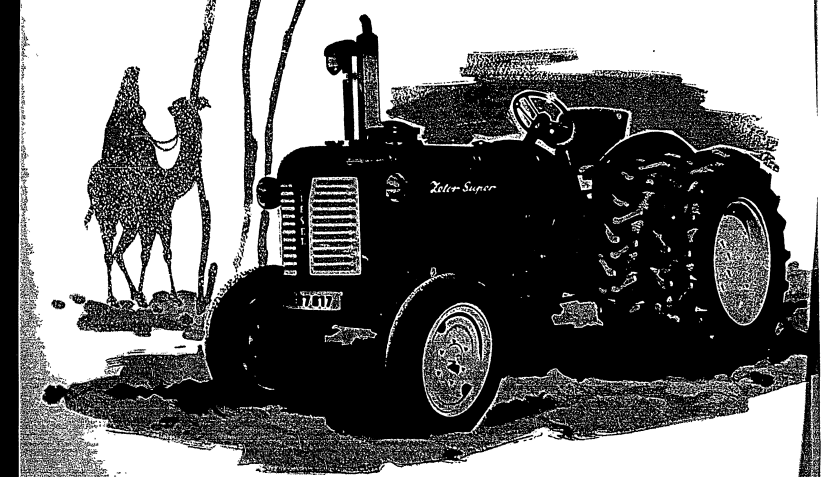
Zetor 25 K



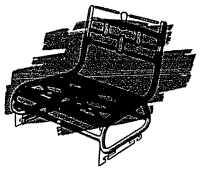
d particularly for field cultivation job. This model is fitted
ine as the A type with the exception of the maximum num-
2500 R. P. M., whereas in the case of the A type the ma-
The ZETOR 25 K cultivation tractor is, therefore, in fact a modi-
A model it retains the versatility of the A type, but is adapted
for cultivation operations. The ZETOR 25 K model has, therefore, a front
axle with a higher ground clearance (520 mm in comparison with 420 mm in the case of the
A type) and rear wheels of a larger diameter so that the ground clearance under both its
front and rear axles as well as under the gearbox is increased. The size of the rear tyres is either
13—28 or, particularly when working in narrower rows, 12—36 or for special work size 13—28.
In connection with the ZETOR 25 A type which has six forward speeds ranging from 3.4 to approx.
27.6 km/h the speeds of the K model are arranged to protect cultivation for slower cultivation ope-
rations the top limits of the forward speed stands at three ratios only to about 18 km/H.

Zetor SUPER

The ZETOR SUPER tractor, the strongest brother of the ZETOR 25 tractors, is also a general-
purpose machine of robust steel design. Its power unit is a four-cylinder, four-stroke OHV Diesel
engine with direct fuel injection the fuel consumption is, therefore, even lower than in the case
of the aforementioned engines. The operating economy of this tractor model is really surprising.
The pressure air brake and hydraulic system is operated by means of a high efficiency pump.
The power unit of the ZETOR SUPER proved extremely efficient and proved its good features when subjected
to the hardest tractor tests which were carried out in the peak temperature conditions of Northern
Brazil. On special request a radiator screen which can be rolled up is also delivered for territories with a low temperature. Likewise all kinds of filters cleaning air, oil and fuel are of the
two-stage type. The gear box is provided with five forward speeds and one reverse speed.
On request it is possible to deliver same with a reduction gear which will reduce speed to
creeping.



- **Two accelerators,** a hand-operated accelerator lever and a foot-operated accelerator pedal, are among the further features of the ZETOR tractor. It is possible to make use of either of these accelerators according to the kind of job to be done.
- **Exceptionally easy starting** of the engine, even under the coldest weather conditions, is made possible by using a heavy-duty 4 H. P. starter motor and special heater plugs. A special device is assenbled on the ZETOR SUPER to increase the injected doses of fuel when starting.
- **By means of a decompression lever** which is operated from the driver's seat it is possible to decrease the compression in the cylinders to the minimum this contributing very effectively to easier starting of the tractor engine.



- **On special request** all three types of ZETOR tractor can be equipped with a pressure air braking system which ensures also safe braking of trailers being hitched behind the tractor. The importance of this attachment is clearly evident also from the fact that it has recently been prescribed as a necessary precaution in the local safety regulations in some European countries.
- **A small air compressor** which is driven from the crankshaft by means of timing gears can also be delivered on special order. It can be used for feeding the pressure air brake system, for tube inflating, etc.
- **A double seat** can also be delivered in the latest production series on special request.
- **In addition to the complete** electrical equipment the ZETOR tractor can be equipped on special request with a rear-mounted headlamp for night ploughing.
- **The high transport speed** of the ZETOR 25 A tractor (about 28 km/H) as well as perfect stability of the machine predestines this type of tractor also for quick transport jobs.
- **All three types** of ZETOR tractors are fitted both with a top-mounted coupling hook, e. g. for hitching trailers, and a lower situated swinging drawbar, i. e. a laterally as well as vertically adjustable bracket for hitching drawn implements. All types of farm machinery can, therefore, be hitched behind a tractor which is provided with the above mentioned mechanisms.
- **The hydraulic power lift** can be equipped, on request, with a special overload release device which disengages the engine clutch and thus stops the tractor, should the mounted implement meet an obstruction such as stone, rock, etc.
- **All levers for controlling the individual mechanisms** of the tractor are advantageously situated near the driver's seat.
- **The dashboard** is fitted with the necessary checking equipment: an oil pressure gauge, a water temperature indicator, an ammeter (on request), a heater plug and starter switch, a heater plug pilot resistor, an enclosed contact socket for the switch box key, a charging pilot light, a gear shift diagram and, if a pressure air brake system is delivered, a pressure gauge.

As we are constantly improving and developing the construction and design of the ZETOR tractors, all specifications and illustrations in this pamphlet are subject to alteration without notice.

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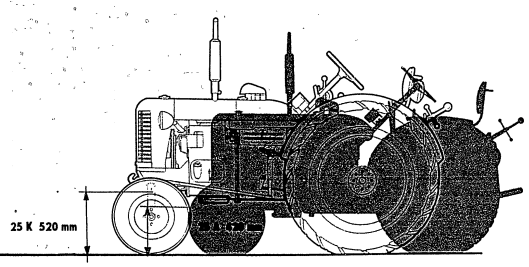
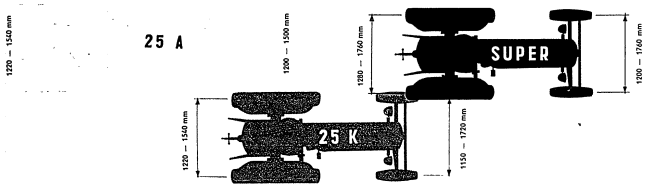


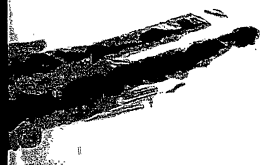
THE VERSATILITY

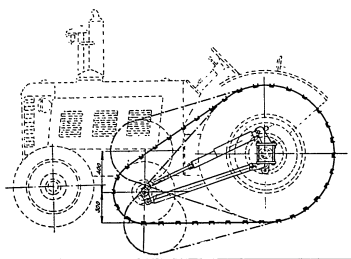
of all three types of ZETOR tractors is the result of their constructional design and plentiful equipment.

- **Differential** - all three wheel types of the ZETOR tractors are equipped with a differential lock which is operated from the driver's seat and used particularly for eliminating slipping in the case of the rear wheels not being uniformly loaded, e. g. when ploughing, in muddy soils, etc.
- **The width** of both the front and rear wheels can be adjusted, if necessary, according to the kind of job to be done. The front wheel width of the two ZETOR 25 tractor types is adjustable from 1,220 to 1,540 mm and, in the case of the ZETOR SUPER tractor, it can be adjusted within the limits of 1,200 and 1,760 mm. The adjustability of the rear wheels of the three tractor models varies as follows: 1,200—1,500 mm in the case of the ZETOR 25 A type, 1,150—1,720 mm in the case of the ZETOR 25 K model and 1,280—1,760 mm in that of the ZETOR SUPER tractor.



- **In areas** covered with loose sand or in wet soils the ZETOR SUPER tractor can be provided with double-mounted rear wheels. In such a case the tractor must be supplied with a rear axle which is specially adapted for this purpose with regard to the considerably increased stress. A tractor with such special equipment has, of course, even less a smaller possibility of slip and also a higher drawing power, i. e. pulling performance on the coupling hook.
- **The tractor pull** can be further increased in difficult terrain by providing the tractor with a semicaterpillar which is made of textgumoid and mounted partly on the rear wheels, and partly on special wheels suspended on swinging rods in the centre of the tractor. This semicaterpillar can be mounted on both the ZETOR 25 and the ZETOR SUPER tractors. A tractor provided with the semicaterpillar has increased pull as well as stability, it can master better all obstructions and can be very successfully used in snow, sand and exceptionally wet soils. This type of tractor retains all advantages of the wheel type and, moreover, concentrates many special properties of the semicaterpillar tractors.



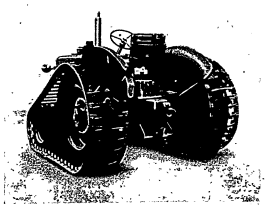


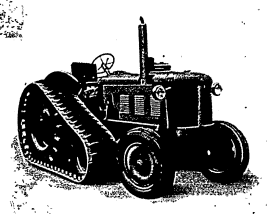
- **The belt pulley and the power take - off shaft** of the direct drive are included in the standard equipment of both types of the ZETOR tractor 25 A and 25 K and enable the tractor to be used for driving all farm machinery as well as other stationary machines which are adapted so as to be driven from a belt pulley or direct drive.
- **The new production series** of the ZETOR SUPER tractors are fitted with an independent drive of the power take-off shaft. When working, for example, with a binder by an independent drive and it is necessary to stop the tractor suddenly by engaging the clutch pedal, the independent drive and hereby also the cutter bar of the binder do not stop operating, thus eliminating particular clogging of the knives. The advantage of this arrangement is great and we can meet with it only in the case of the latest tractor models.
- **During some special farm jobs** particularly when planting different sorts of vegetables, when singling sugar-beet, etc. the tractor with its operating set has to drive along the field very slowly. The gearboxes on the latest production series of the ZETOR SUPER tractors are, therefore, equipped with reduction gears so that the tractor has on the whole 10 forward speeds, the first of which - the so called creeping speed - amounts to about 0.95 km/H at 1500 RPM. The whole scale of the creeping speeds of the ZETOR SUPER tractor is as follows:

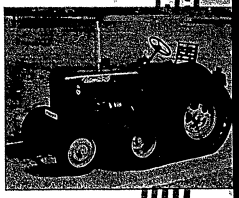
Ist creeping speed - 0.95 km/hr
IInd creeping speed - 1.25 km/hr
IIIrd creeping speed - 1.80 km/hr
IVth creeping speed - blocked
Vth creeping speed - 5.90 km/hr
Reverse creeping speed - 0.90 km/hr

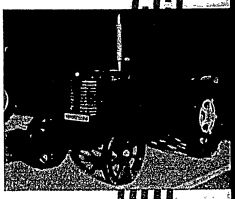
This arrangement is, of course, very advantageous and enables the best as well as the most economical exploitation of the power output of the ZETOR SUPER tractor.

- **The up-to-date hydraulic power lift of the three-point type** which is mounted on all three types of the ZETOR tractors makes it possible to use any special kind of the mounted farm machines - ploughs, harrows, cultivators, hoes, seed drills, cutter bars, planters, hillers, tillers, post hole diggers, rotavators, etc.
- **The hydraulic switch** is designed for driving all types of farm machinery with mechanisms operated by means of hydraulic ram cylinders and increases the versatility of the tractor. All three types of tractors of the ZETOR line can be fitted with this attachment.
- **As the tractors** have often to operate in dusty areas, particularly in the tropics, the working parts of their mechanism which are easily vulnerable must be protected by perfect filters. All filters, i. e. the oil and fuel filter as well as the air cleaner, are, therefore, of the two-stage type.
- **The comfort and safety of the driver** are well safeguarded particularly by a broad and comfortable seat which is perfectly sprung and spring-cushioned.
- **A driver's cabin** can also be supplied on special order for all types of ZETOR tractors. This cabin, which is of solid tube structure, is provided with safety glass a detachable roof, spare seats for oc-drivers, a windscreen wiper and a traffic indicator; it protects the driver reliably when working under unfavourable weather conditions, particularly when it rains and offers perfect visibility all around.
- **The reliable brakes** of the rear wheels are operated by means of two foot levers (pedals) acting on each wheel separately so that the rear wheels can be braked individually, thus enabling the tractor to be turned on the spot. The brakes are fitted with a latch by means of which both pedals can be locked together, this being necessary particularly when driving on a road.









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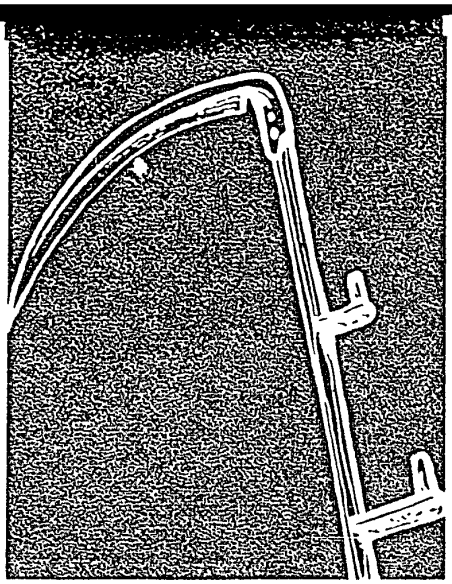
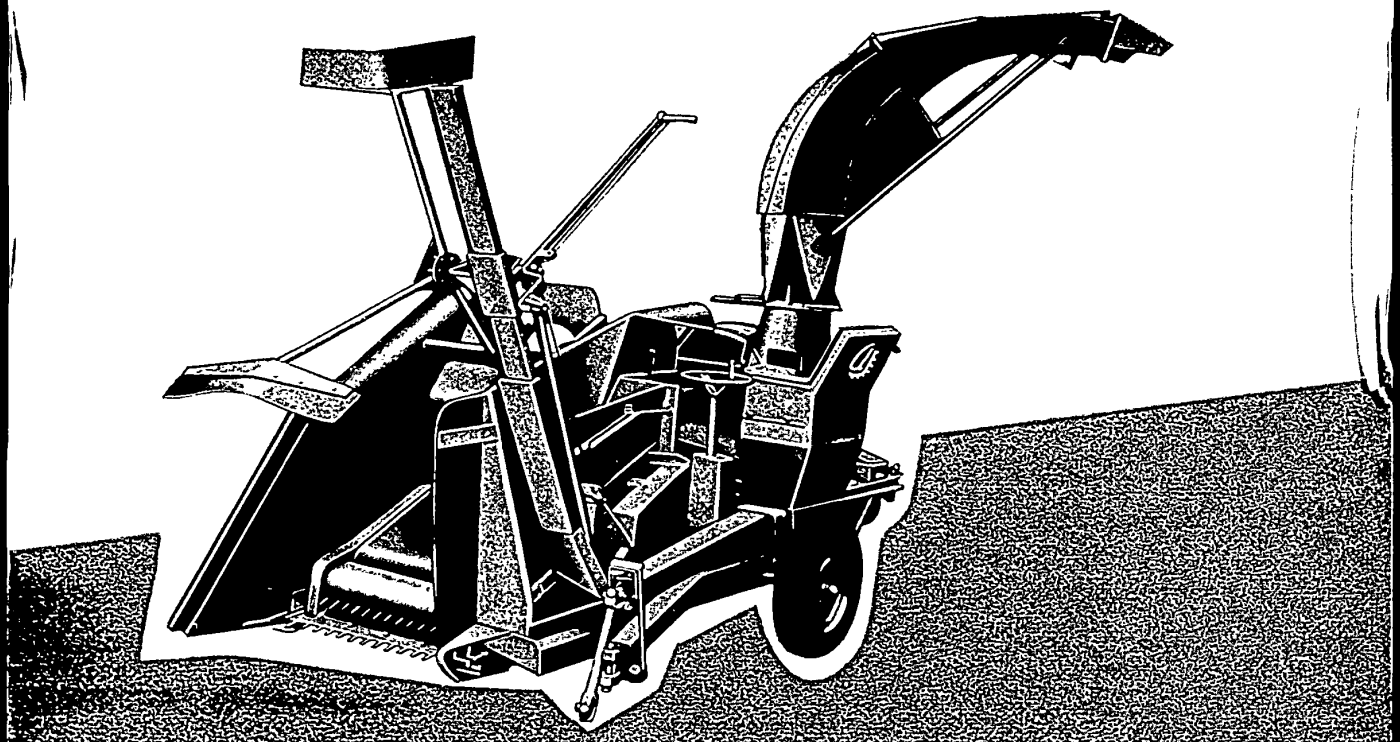
THE SŘZ 42
ENSILAGE HARVESTER





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SŘZ 42

SPECIFICATIONS

Basic unit:

Total weight including deflector	1,130 kg
Overall length	3,350 mm
Overall width	2,100 mm
Overall height without deflector	1,650 mm
Overall height including deflector	1,450 mm
Speed of knife wheel	600 RPM
Width of intake throat	420 mm
Length of chaff	20—40—80—160 mm
Tread of transport wheels	1,850 mm
Tyre size	6.5—16.00

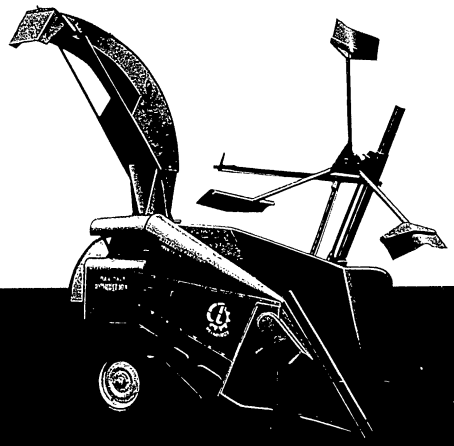
Cutting mechanism:

Weight	590 kg
Length	2,200 mm
Width	1,350 mm
Height	2,000 mm
Working width	100 cm
Output	250 q/hr

Pick-up mechanism:

Weight	290 kg
Length	1,470 mm
Width	1,980 mm
Height	1,765 mm
Working width	150 cm
Output	0.6 ha of fodder or straw/hr

As we are constantly improving and developing the construction and design of all our machines and implements, the specifications as well as illustrations should not be regarded as binding.



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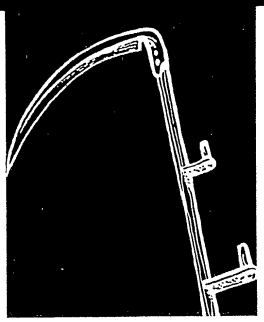
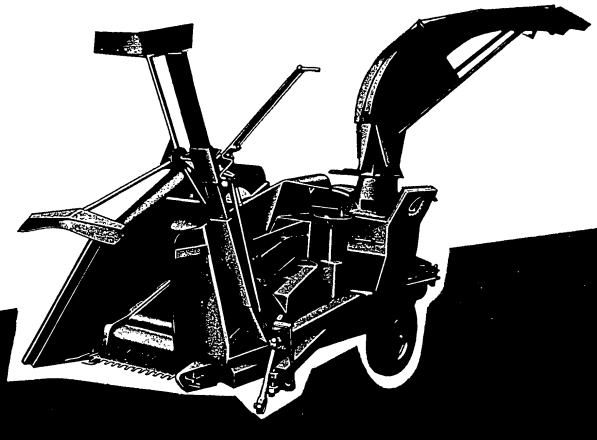
PRAHA-CZECHOSLOVAKIA

THE SŘZ 42 ENSILAGE HARVESTER





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SŘZ 42

SPECIFICATIONS

Basic unit:	
Total weight including deflector	1,130 kg
Overall length	3,350 mm
Overall width	2,100 mm
Overall height without deflector	1,650 mm
Overall height including deflector	1,450 mm
Speed of knife wheel	600 RPM
Width of intake throat	420 mm
Length of chaff	20—40—80—160 mm
Tread of transport wheels	1,850 mm
Tyre size	6.5—16.00
Cutting mechanism:	
Weight	590 kg
Length	2,200 mm
Width	1,350 mm
Height	2,000 mm
Working width	100 cm
Output	250 q/hr
Pick-up mechanism:	
Weight	290 kg
Length	1,470 mm
Width	1,980 mm
Height	1,765 mm
Working width	150 cm
Output	0.6 ha of fodder or straw/hr

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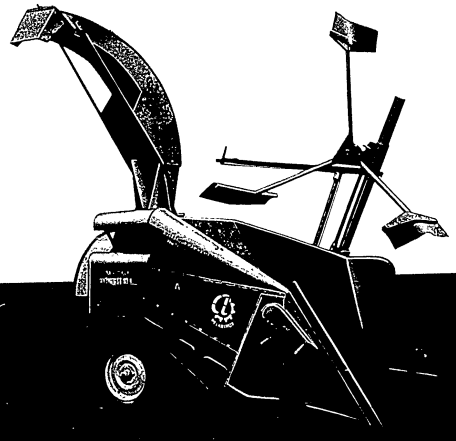

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PK-15

SPECIFICATIONS

Maximum output in steam-boiling of potatoes when using combustibles with heating value of 7,000 Kcal/kg	20 q/hr
Average output	15 q/hr
Boiler:	
Type	vertical flue type
Number of flue tubes	44
Capacity	570 l
Heating surface	15 m²
Maximum amount of steam produced	240 kg/hr
Operating pressure	0.2 atm.
Area of grate	0.82 m²
Capacity of water tank	500 l
Type of fuel	wood or coal
Washing machine:	
Diameter of drum	640 mm
Overall length of drum	1,465 mm
Speed	45 RPM
Capacity of pan	200 l
Electric motor	1.3 kw
Speed of electric motor	1,400 RPM
Conveyor:	
Type	worm type
Gradient	190 mm
Overall length	2,900 mm
Diameter	420 mm
Speed	110 RPM
Steaming container:	
Inner diameter	950 mm
Capacity	1.8 m³
Speed of electric motor	1,400 RPM
Discharging conveyor:	
Type	worm type
Gradient	200 mm
Overall length	2,000 mm
Speed variable within the limits of	0.5—1.5 RPM
Electric motor	0.8 kw
Speed of electric motor	1,400 RPM
Mashing machine:	(can be reduced to 50 RPM)
Model	worm type with grid
Inner diameter	250 mm
Overall length	1,300 mm
Speed	110 RPM
Electric motor	1.1 kw
Speed of electric motor	1,400 RPM
Truck:	
Front wheel tread	1,400 mm
Rear wheel tread	1,840 mm
Wheelbase	4,075 mm
Tyre size	160—18
Turning radius	10 m
Overall transport dimensions:	
Length	7,500 mm
Width	2,000 mm
Height	3,500 mm
Weight	4,200 kg

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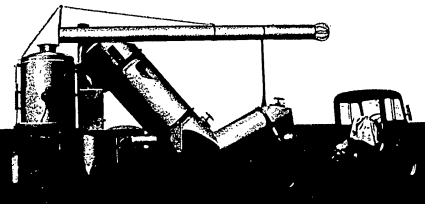

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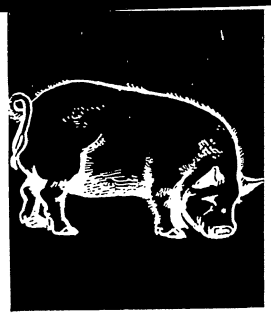
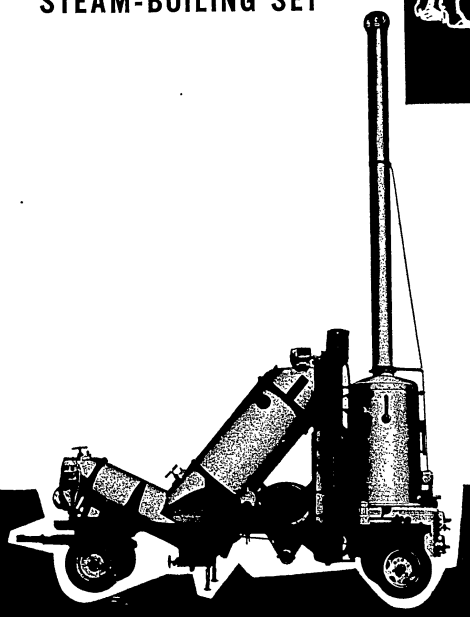
THE PK-15 CONTINUOUS MOBILE STEAM-BOILING SET





PK-15

SPECIFICATIONS

Maximum output in steam-boiling of potatoes when using combustibles with heating value of 7,000 Kcal/kg	20 q/hr
Average output	15 q/hr
Boiler:	
Type	vertical flue type
Number of flue tubes	44
Capacity	570 l
Heating surface	15 m^2
Maximum amount of steam produced	240 kg/hr
Operating pressure	0.2 atm.
Area of grate	0.82 m^2
Capacity of water tank	500 l
Type of fuel	wood or coal
Washing machine:	
Diameter of drum	640 mm
Overall length of drum	1,465 mm
Speed	45 RPM
Capacity of pan	200 l
Electric motor	1.3 kw
Speed of electric motor	1,400 RPM
Conveyor:	
Type	worm type
Gradient	190 mm
Overall length	2,500 mm
Diameter	420 mm
Speed	110 RPM
Steaming container:	
Inner diameter	950 mm
Capacity	1.8 m^3
Speed of electric motor	1,400 RPM
Discharging conveyor:	
Type	worm type
Gradient	200 mm
Overall length	2,000 mm
Speed variable within the limits of	0.5—1.5 RPM
Electric motor	0.8 kw
Speed of electric motor	1,400 RPM
Mashing machine:	(can be reduced to 50 RPM)
Model	worm type with grid
Inner diameter	250 mm
Overall length	1,300 mm
Speed	110 RPM
Electric motor	1.1 kw
Speed of electric motor	1,400 RPM
Truck:	
Front wheel tread	1,400 mm
Rear wheel tread	1,840 mm
Wheelbase	4,075 mm
Tyre size	160—18
Turning radius	10 m
Overall transport dimensions:	
Length	7,500 mm
Width	2,000 mm
Height	3,500 mm
Weight	4,200 kg

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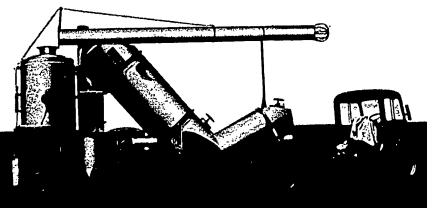

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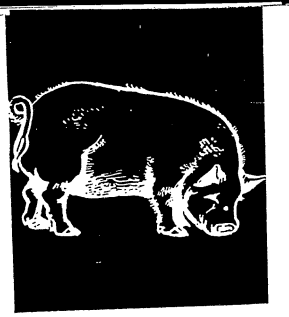
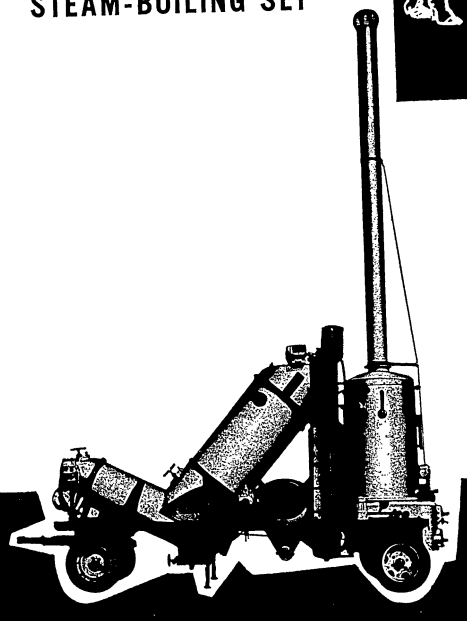
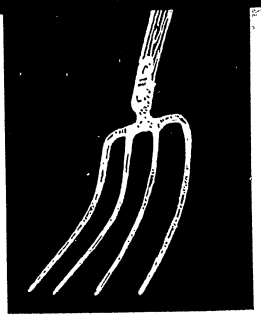
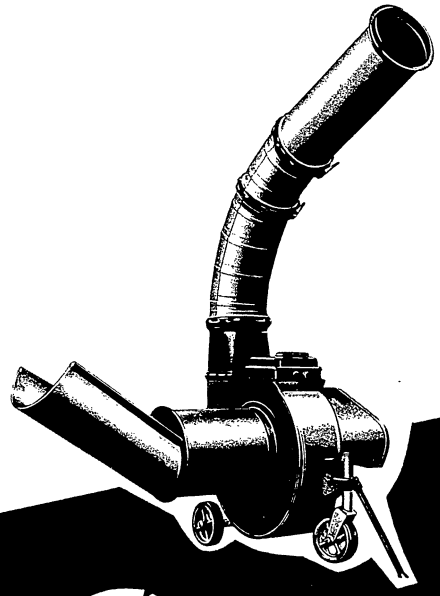
THE PK-15 CONTINUOUS MOBILE STEAM-BOILING SET





THE ŘRM ROTARY FORAGE CUTTER





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ŘRM

SPECIFICATIONS

Electric motor	7.5 kw
Speed of disc wheel	1,000 RPM
Weight	380 kg
Overall height	1,500 mm
Overall width	1,300 mm
Overall length	1,300 mm

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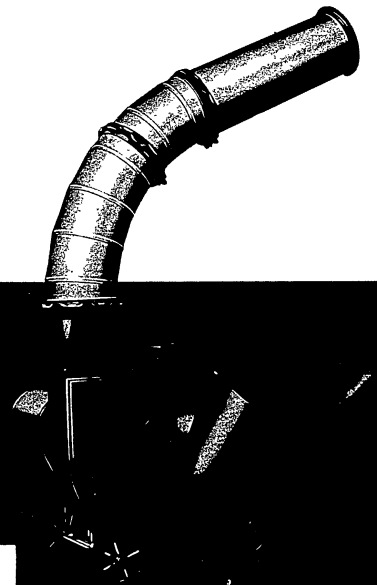

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MTZ 8

SPECIFICATIONS

Working width	5 or 6 rows
Adjustable row width:	
in case of 6 rows	400—500 mm
in case of 5 rows	600—720 mm
Wheel tread adjustable to	1,250—1,300—1,350—1,400—1,450 mm
Working speed	4—6 kg/hr
Travelling speed	20 km/hr
Tank capacity	8 hl
Depth of hoeing	30—80 mm
Depth of chiselling	50—150 mm
Overall width	3,000 mm
Overall length	3,900 mm
Overall height in working position	1,300 mm
Overall height in transport position	2,000 mm
Total weight including hitch and implements for handling beet	820 kg

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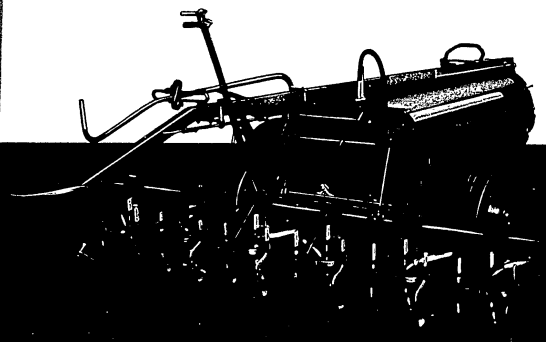

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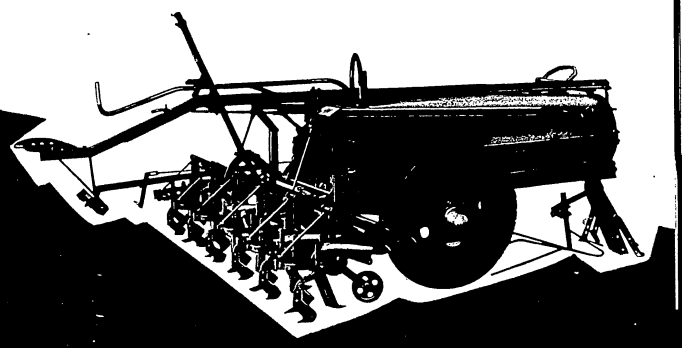
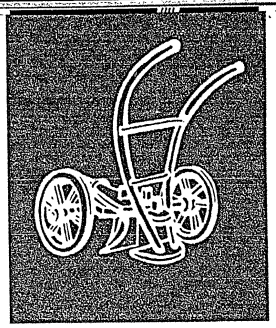
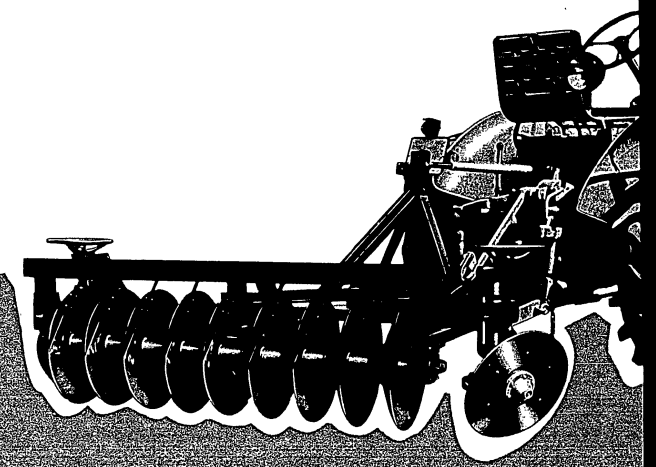
THE MTZ 8 LIQUID MANURE SPREADER



THE PDN 120 DISC PLOUGH FOR SHALLOW PLOUGHING





This new member of the comprehensive line of mounted implements of Czechoslovak make is designed for shallow ploughing up to a depth of 8—12 cm.

The rectangular frame of this plough is made of welded steel sections. Cast steel components, such as the depth adjusting wheel are provided on the shoe (frame) and on the rear end of the beam. Attachment of scrapers is effected by the means of the beam (frame). To this end, brackets with holes for mounting of the scrapers are welded (suspended, for pins to be connected with the lower arms of the hydraulic power lift or with a carrying frame connecting the upper ends of the lower arms mounted on the plough. The 9 spherical discs are made of 3 mm thick and their radius (r) is 430 mm. They are mounted on a square shaft and protected with dust coverings.

The depth control wheel is mounted on the rear end of the beam. It is movable, working depth and for taking the plough out of the furrow at the headland. For this purpose, the adjusting and locking mechanism forms the rear wheel carrying arrangement.

The cast iron wheel runs on two tapered roller bearings mounted to the axle. A flat ring made of 4 mm thick is attached to the outer side of the land wheel in order to take the side thrust.

When ploughing in hard, heavy soil, rocky soil, or soil containing stones, the danger of damaging of the discs could occur. To avoid this, the plough is equipped with scrapers.

Up-to-date design, first class material and advantages of mounted implements in general indicate that the PDN 120 disc plough for shallow ploughing will become a valuable helper of every farmer.

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PDN-120

SPECIFICATIONS

Overall length	1500 mm
Overall width	1850 mm
Overall height	1400 mm
Weight	430 kg
Working width	1200 mm
Ground clearance in transport position	220 mm
Output	1 ha/hr.
Disc diameter	500 mm
Distance between discs	180 mm
Number of discs	9
Type of tractor for operating the plough	ZETOR 25 or other type with power output of approx. 25 H. P.

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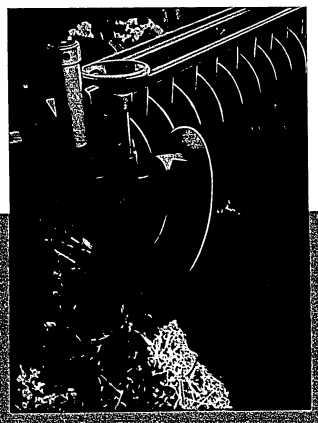

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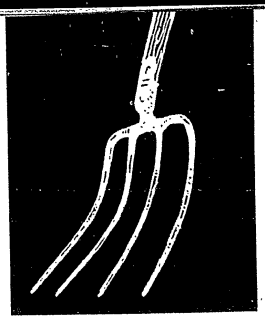
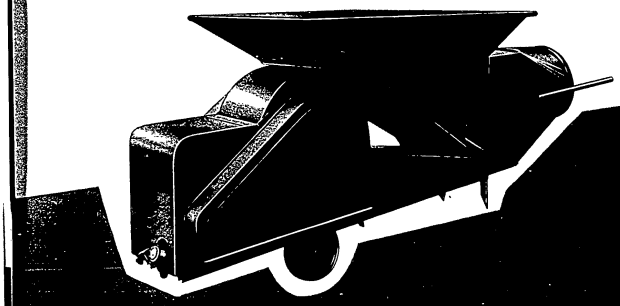
THE IDEAL 500 FORAGE BLOWER





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IDEAL 500

The "IDEAL 500" forage blower is produced and supplied either with an electric motor or without it. Quality material and convenient design make the "IDEAL 500" forage blower a really ideal helper of every farmer.
Standard equipment: 6 m of pipes (lay-out: 1—3 m, 1—2 m, 1 × 1 m), 2 unflexible elbows of 45°, 1 unflexible deflector and 8 quick-acting ring couplings.
Optional equipment: any number of pipes in required layout, ring couplings, differently bent unflexible elbows, flexible elbows.

SPECIFICATION

Weight (without electric motor)	105 kgs
Weight (with electric motor) (weight is to be understood without pipes)	210 kgs
Required driving power	5.5 kW electric motor 1440 r. p. m.
Overall transport length	maximum 50 m
Output	1 t forage/10—15 min.

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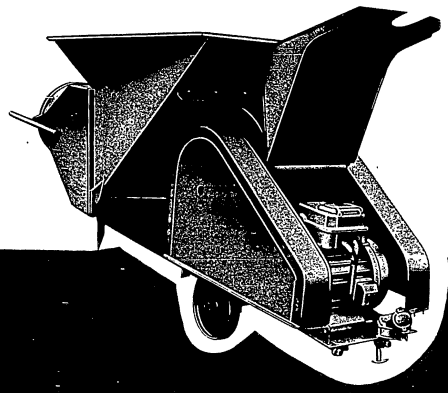

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TORON

SPECIFICATIONS

Diameter of pipes	500 mms
Angle of elbows	45 °
Length of individual pipe sections	1 m
Approximate weight of individual pipe sections	15 kgs
Approximate weight of machine without pipe line	300 kgs
Approximate weight of machine with pipe line (according to overall length of pipes)	450 kgs
Overall length without pipe line	2650 mms
Overall height without pipe line	1540 mms
Overall width	1250 mms
Performance at power input of 7.5 HP	3000 kg/hr

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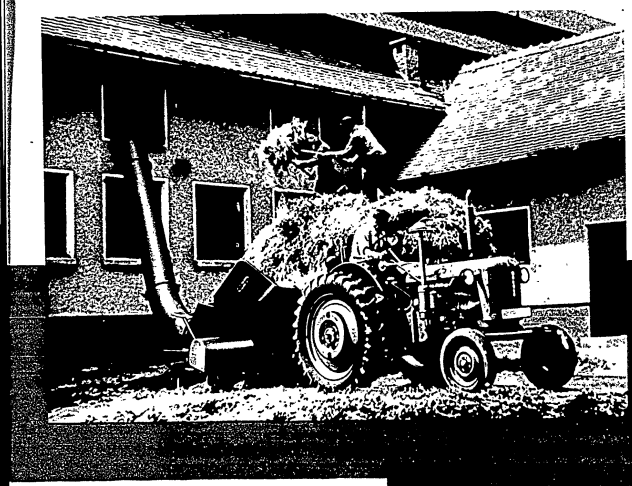

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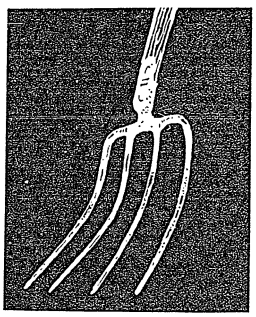
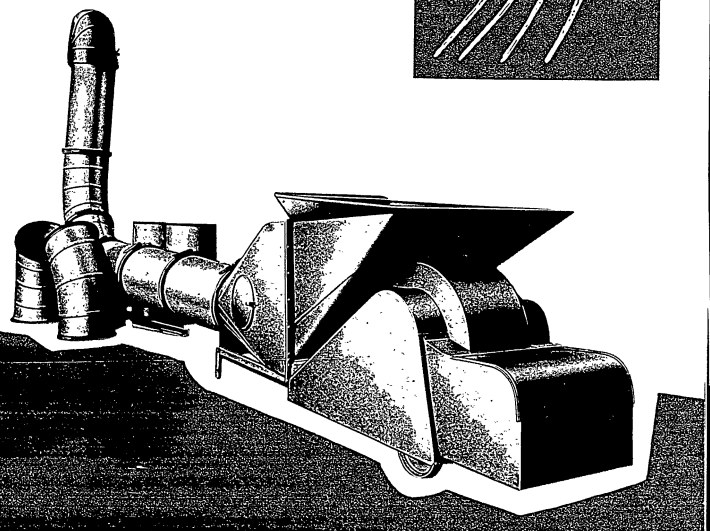
THE TORON HAY AND STRAW BLOWER





THE STELLA 30 A HORSE DRAWN HOE

The STELLA 30 A horse drawn hoe is a simple but heavy-duty implement used for hoeing, ridging and hilling. The joint type of its arrangement makes it possible to hoe both the row and the balk close to the edge of the plot. The individual hoeing sets can, therefore, be adjusted laterally (i. e. along the frame) in any manner. The individual sets of hoeing teeth operate independently of one another, thus enabling the operator of the implement to handle a field with an uneven surface. The width control is operated by adjusting the clamp on the front beam, loosening the bolt in the clamp of the cross members and re-adjusting the arms. The depth is controlled by shifting the shanks of the hoeing teeth after loosening the bolt in the clamps of the shanks.

The equipment of this hoe includes 3 ridging bodies.

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STEYR

STEYR-DAIMLER-PUCH

SPECIFICATIONS

Overall length	3,950 mms
Overall width	1,500 mms
Overall height	1,020 mms
Working width	1,070 mms
Cutting depth	100 mms
Weight	125 kgs

As we are constantly improving and developing the construction and design of all our machines and implements, the specifications and illustrations should not be regarded as binding.

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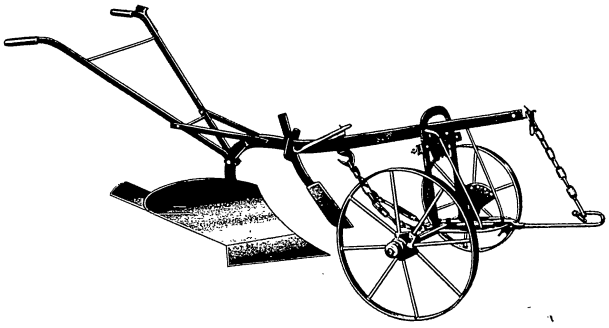
PP-25
SINGLE-PLOUGHSHARE YOKE PLOUGH



This is a very suitable plough for ploughing culture soils. The plough construction in welded of steel. The working depth can be set by the plough-iron heads. The raker is made of three-layer armour steel. The plough is constructed for a horse yoke.

TECHNICAL DATA

Weight	90 kgs
Working width	28 cms
Ploughing depth	18 cms

MATADOR DOUBLE-PLOUGHSHARE YOKE PLOUGH

This is a well proven plough for speedy shallow (first) or medium ploughing. Its rigid frame construction and suitably chosen bar radius ensure an outstanding output. The mouldboards are of the normalized "V" type and are counted among the best of their kind. The working depth can be controlled by the two-way catch of the sink lever.
The wheels can be set (differentialy or parallely) in any direction.

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The standard accessories consist of 1 reserve edge, 1 raker and 1 wrench. A coulter and tiller can be delivered on special order. The tiller is specially advantageous and enables shifting of the towing hook according to need without stopping the yoke when ploughing ground.

TECHNICAL DATA

Weight	108 kgs
Working width	45 cms
Ploughing depth	18 cms

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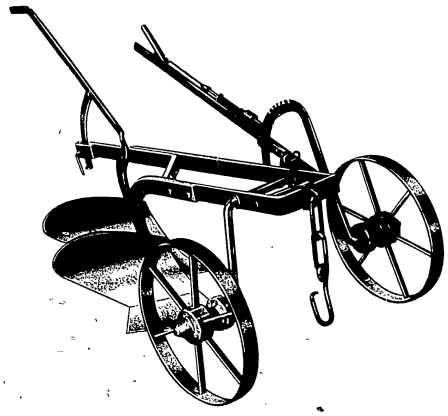

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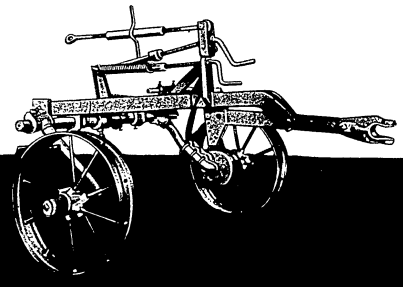
KPZ 6

SPECIFICATIONS

Overall length	4855 mms
Overall width	1640 mms
Overall height	1120 mms
Weight	680 kgs
Cutting width of 1 long hoeing tooth	165 mms
Cutting width of 1 short hoeing tooth	140 mms
Maximum working width of hoe	2800 mms

As we are constantly improving and developing the construction and design of all our machines and implements, the specifications and illustrations should not be regarded as binding.



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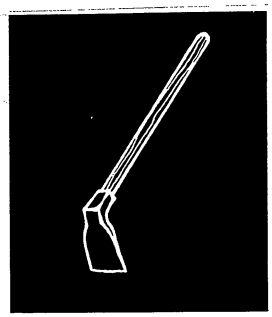
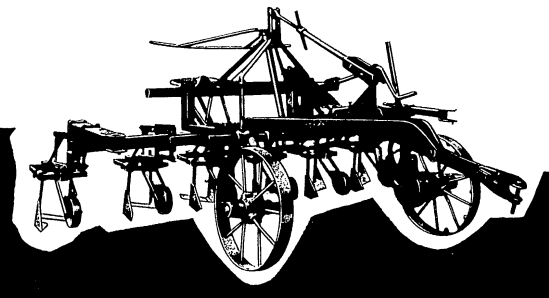
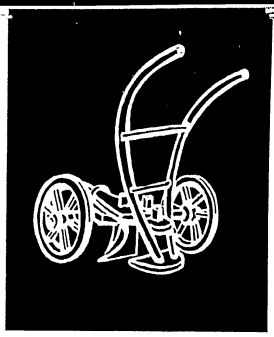
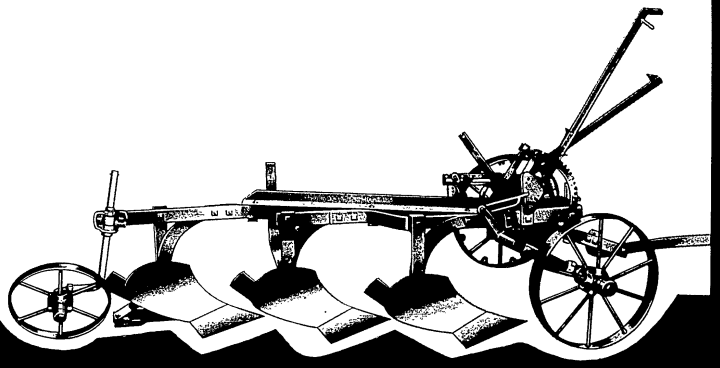
THE KPZ 6
TRACTOR DRAWN HOE





THE MARS PICCOLO 332 THREE - FURROW TRACTOR - DRAWN PLOUGH





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MARS PICCOLO

SPECIFICATIONS

Overall length	3510 mms	Total working width	75 cms
Overall width	1170 mms	Maximum working depth	21 cms
Overall height	810 mms	Weight including accessories	236 kgs
Ground clearance below frame	492 mms	Pulling strength on hook at specific soil resistance of	
Longitudinal spacing of bottoms	500 mms	60 kg/dm²	approx. 1178 kgs
Cutting width of one bottom	25 cms	Performance at e speed 5 km/hr	0.35 ha/hr

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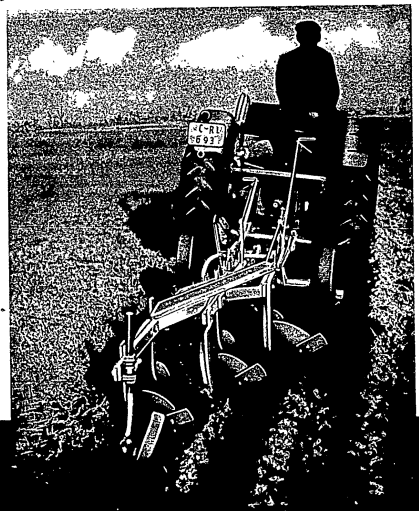

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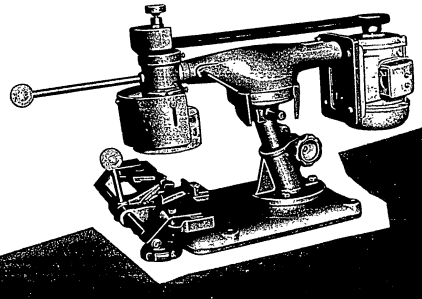
BEPKU-125
SCYTHE GRINDER



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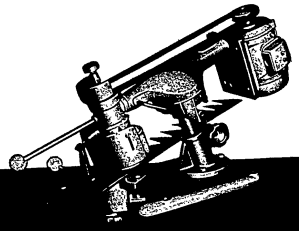
BEPKU 125

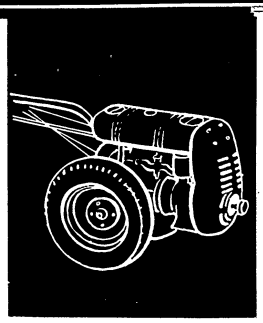
TECHNICAL DATA

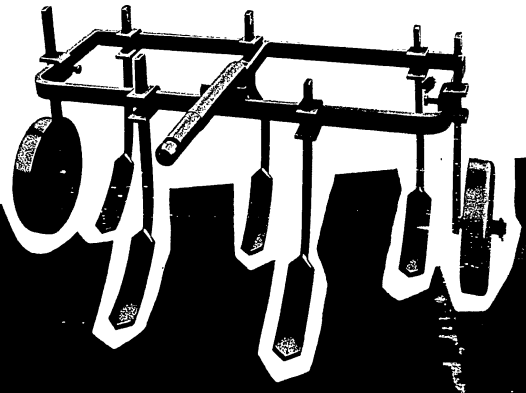
Electric motor	0,3 kW
Number of revolutions	2800 r. p. m.
Grinding angle	19°
Setting angle of scythe table	60°

In view of constant development the data and illustrations must not be considered as binding.



THE KRM 116 THREE-ROW CULTIVATOR





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KM 64 · KRM 116

SPECIFICATIONS

Overall length	770 mms
Overall width	1310 mms
Overall height	525 mms
Working width	1160 mms
Maximum working depth	120 mms
Weight	40 kgs

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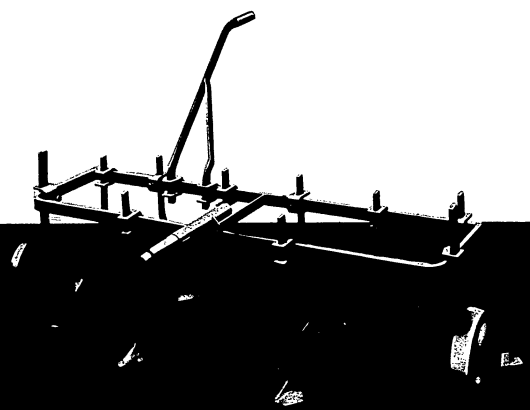

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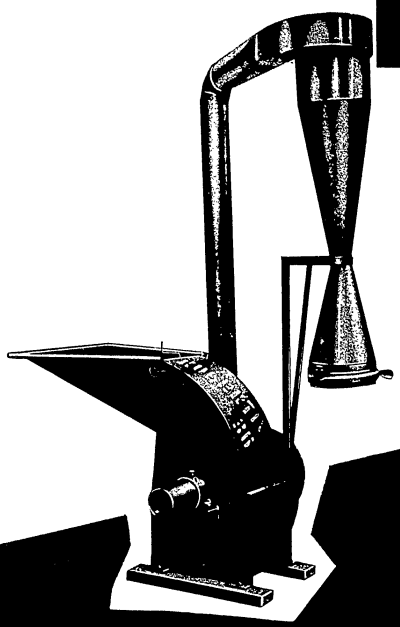
THE ŠK 36 AND ŠK 24 HAMMER MILLS



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ŠK 36-ŠK 24

SPECIFICATIONS

	ŠK 36	ŠK 24
Overall height with cyclone	2375 mms	2900 mms
Overall width with cyclone	1570 mms	2650 mms
Overall length with cyclone	1980 mms	1650 mms
Weight with cyclone	276 kgs	260 kgs
Rotor housing diameter	450 mms	450 mms
Number of hammers	36	24
Number of revolutions of the hammer disc	3300 Rev/min	3300 Rev/min
Required power input	16—25 HP	10.2 HP
Driving belt pulley diameter	120 mms	120 mms
Required belt width	180 mms	180 mms
Performance in kg of material handled per hour	500—1500 kh/hr	100—1000 kh/hr
Set of screens having perforations with diameter	3, 5, 8 mms	1.5, 3, 5 mms

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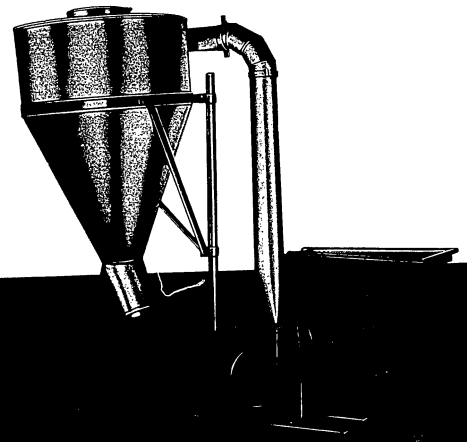

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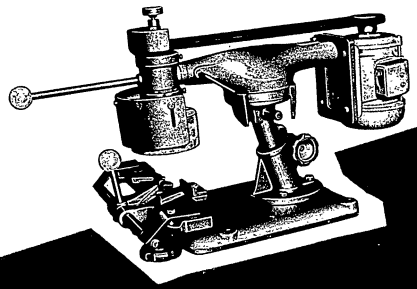
BEPKU-125
SCYTHE GRINDER



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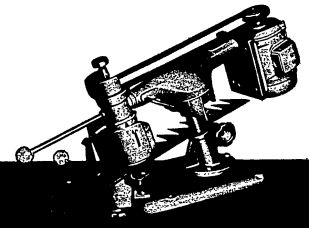
BEPKU 125

TECHNICAL DATA

Electric motor	0,3 kW
Number of revolutions	2800 r. p. m.
Grinding angle	19°
Setting angle of scythe table	60°

In view of constant development the data and illustrations must not be considered as binding.



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Sz: 01-30655-57-a

6. easy engaging
7. high manoeuvrability and lightness of control
8. perfect fixing of tracks to bushings of rear axle shafts and to torsion bar of the spring suspension

The ZETOR SUPER Diesel crawler tractor may be equipped with a bulldozer blade for special jobs as well as with a winch driven by power—take-of shaft of the tractor which can be fixed to the rear wall of the gear box. This winch forming a sturdy unit has its own gear box with two speed ratios and one reverse speed.
Excellent suspension of the driver's seat enables quite comfortable driving. An allmetal driver's cabin which may also be supplied at special request, protects the driver from being exposed to danger while working in forests, thus eliminating the danger of unjury and increasing the safety of the driver.

MOST IMPORTANT TECHNICAL DATA

number of cylinders		4	1st speed	km/hr	2.4
swept volume	cm³	4160	2nd speed	km/hr	3.14
bore/stroke	mm	105/120	3rd speed	km/hr	4.30
power output	H. P.	42	4th speed	km/hr	7.30
number of revolutions	Rev./min.	1500	5th speed	km/hr	14.60
maximum length	mm	3330	reverse speed	km/hr	2.4
maximum width	mm	1660	weight	kg	4200
maximum length (including exhaust pipe	mm	2000	width of track chains (at special request track chains with different widths may be mounted)	mm	330

As we are constantly developing and improving the construction and design of this machine, all technical data and illustrations should not be regarded as binding.

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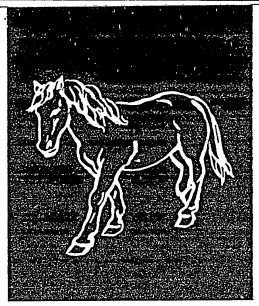
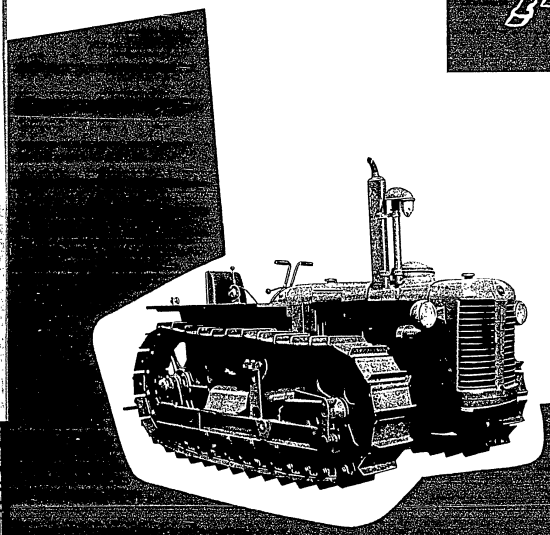
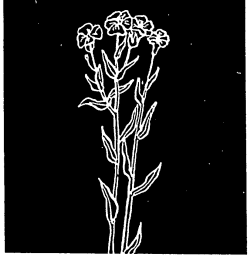
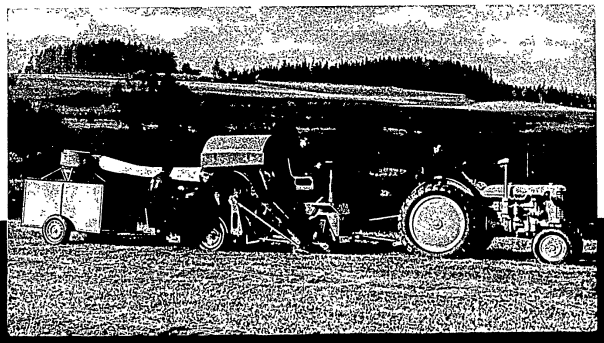
THE ZETOR SUPER DIESEL CRAWLER TRACTOR





THE SLOZ FLAX PICKER AND THRESHER





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SLOZ

TECHNICAL DATA

Machine length without trailer	3380 mm
Machine length with trailer	6740 mm
Machine length width trailer	1860 mm
Machine length height trailer	2310 mm
r. p. m. of the driving shaft max.	540 r. p. m.
Necessary engine input approx	20 HP
Wheel gauge	1683 mm
Wheel track	1750 mm
Capacity	0.8 ha
Weight approx	1380 kg
Weight of the trailer approx	1270 kg

Owing to a constant development in construction all the above-mentioned data and illustrations are not to be considered as binding.

As has been said, the SLOZ can, by suitable adjustment, be used as a stationary combing thresher inside the barn. In such a case the propeller shaft is replaced by a suitable vee-belt (540 r. p. m.) and the drive is by electromotor. In front of the collecting device is adjusted a spreading table on which the flax to be combed is spread. To the fan exhaust piping can be attached plate-metal tubes (Ø 300 mm) which facilitate to convey remnants and capsules to the desired spot.

The SLOZ thanks to its construction and capacity marks a revolution in mechanized flax-harvesting.

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THE PLANTAGE 8N SINGLE-ROW HORSE DRAWN HOE

The PLANTAGE 8 N single-row horse drawn hoe can be used for all cultivating jobs. This type of hoe is drawn by a single horse. It is very easy to operate and its working width can be readjusted from 35 cm to 75 cm as required, this being one of its main advantages. This adjustment is done simply by means of the rear lever which moves on a geared quadrant. The working depth of the implement is controlled by the front lever. It is necessary to choose the individual working tools, which are supplied with the hoe as accessories, according to the kind of job to be done. For the first hilling of row crops the hoe must be provided with ridging half sweeps (L-shares) mounted on the side shanks. When the second hilling is to be done, the working surface of these ridging half sweeps (L-shares) must be turned outwards. For the third cultivation of grown up plants the full sweeps (A-shares) are used. After substituting the ridging share on the rear shank by a hoeing tooth, the hoe is converted into a well-proven cultivator: the soil is thoroughly loosened by the hoeing teeth, the weed roots are cut through and the evaporation is substantially reduced in consequence of damaging the capillarity. After equipping the side shanks with ridging half sweeps (L-shares) with their working surfaces turned outwards, and after drawing them together by means of the rear lever, the hoe can be used for hilling.

Versatility, easy operation, perfect control and a long life are the main reasons of the great popularity of the PLANTAGE 8 N hoe. The standard accesories of this implement include: 5 hoeing teeth, 1 ridging share, 1 arrow-shaped full sweep (A-share), 2 ridging half sweeps (L-shares), 1 double-end spanner.

SPECIFICATIONS

Overall length	1940 mm
Overall width	650 mm
Overall height	980 mm
Weight	43 kg
Working width	35—75 cm
Working depth	8—10 cm

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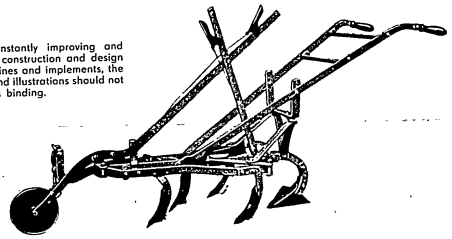

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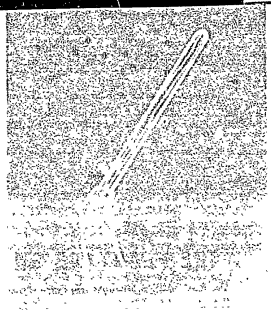
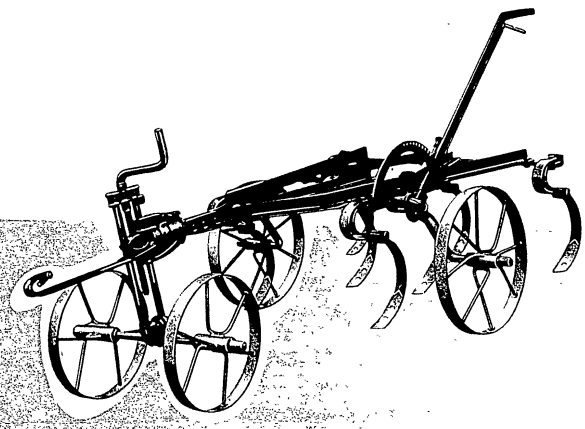
THE TUDOR 7 HORSE-DRAWN CULTIVATOR





The TUDOR horse-drawn cultivator has already proved its good features in cultivating the soil under medium-difficult soil conditions. It is drawn by a team consisting of 2 medium-strong horses.

The well reinforced frame of this plough is made of angle steel; on its bottom part there are located bearings for the cranked rear axle. Several spring tines with shovels are attached to the cross members of the frame. The depth control, i. e. attachment for lifting and lowering the frame with the spring tines, is coupled to the axle. The frame is connected with the front axle by means of a knuckle head with internal square thread. This knuckle head can be vertically adjusted by means of a screw spindle which is mounted on the stay of the front axle. The knuckle head as well as other connecting members are made of malleable cast iron. The wheel spokes are of cast-in type. The wheels are provided with dustproof hubs.

The TUDOR 7 cultivator is a simple, efficient and conveniently designed implement which renders valuable service. Solid construction and quality material guarantee its long service life.

SPECIFICATIONS

Working width	1050 mm
Number of spring tines	7
Approximate weight	120 kg

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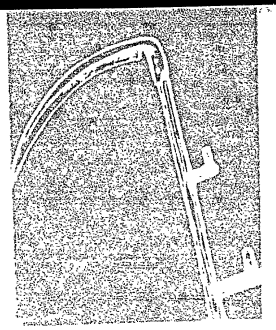
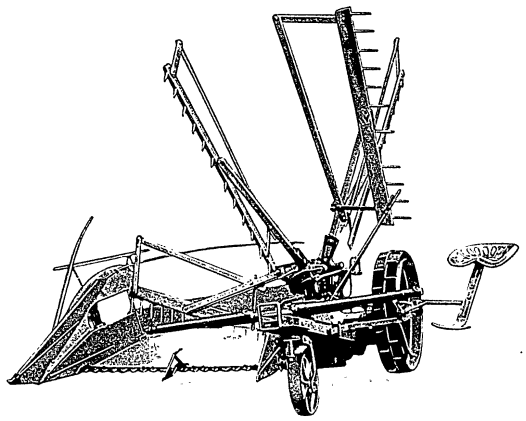
PRIM 152 GRAIN REAPER





The horse drawn grain reaper PRIM 152 can be applied for reaping all sorts of grain. The machine reaps and periodically lays the mown grain on the stubblefield. With the exception of the first pair of toothed wheels all the transmission gear runs in a closed oil-bath. The main wheel and the excentric shaft run on roller bearings. The transmission to the vertical shaft, driving the rakes, is carried out by means of bevel gears, which method ensures a substantial reduction of passive resistances when compared with the frequently used worm gearing. Sheafing is regulated by means of a hand lever, easily accessible from the driver's seat. Disengaging the machine and loading the reaping table is an equally easy operation. Discharging can be interrupted by a foot pedal regardless of how the sheafing scale is adjusted. This facilitates operation in curves. The circular frame, forming the orbit for rakes, is very wide so as to facilitate a gradual and slow width of mowing of grain and eliminate any shocks that might lead to loss caused by grain falling out of ears. The reaping table is of metal, the base is made of angle iron, to which is riveted a steel plate-metal, zinc-plated on both sides. The reaper can easily be transformed from a transportation position into an operating one, and vice versa. One person can carry out this operation in 2 minutes. The reaper is well balanced and the team is not overstrained. In order to balance the shaft thoroughly we can, at special request, supply the reaper with a little wheel under the crankshaft.

PRIM is a reliable machine for the manufacture of which all tried principles of design have been applied; they facilitate easy motion and ensure good service.

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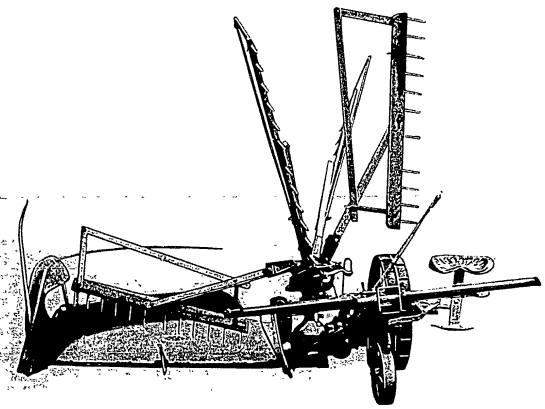
TECHNICAL DATA

Machine length	3500 mm
Machine width	2000 mm
Machine height	2500 mm
Weight together with shaft and shaft carrier	439 kg
Reaping width of reaping ledge	1520 mm
Max. reaping speed	6 km/h

Owing to a constant development in construction all the above-mentioned data and illustrations are not to be considered as binding.



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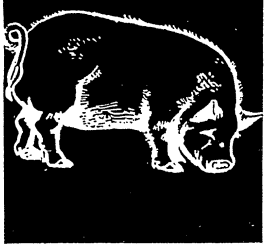
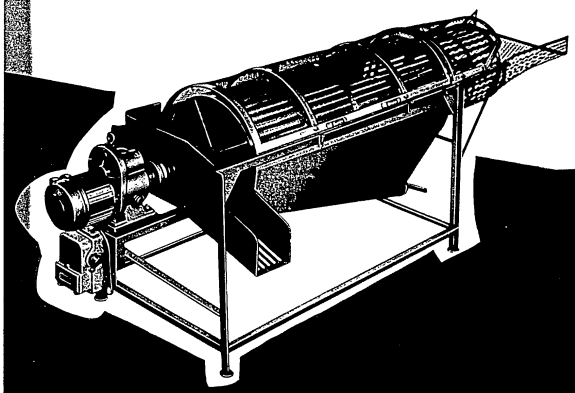
THE PBM 1500 MOTOR-DRIVEN POTATO WASHING MACHINE





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THE MM 15 MOTOR-DRIVEN POTATO MASHER

This potato masher is used for mashing of steam-boiled potatoes for feeding purposes. The machine is of welded steel construction. The worm type conveyor is also made of steel. The implement is driven by a built-in electric motor through the gear box. Both the motor and the terminal board are protected against water by a cover. Potatoes are poured into the charging hopper wherefrom they are forced by the worm type conveyor into the mashing throat. Both the mashing throat and the worm type conveyor are detachable allowing easy cleaning of the masher. The implement is equipped with 2 sheet-iron wheels. The MM 15 potato masher saves labour and money.

SPECIFICATIONS

Overall length	800 mm
Overall width	500 mm
Overall height	800 mm
Weight	35 kg
Speed of worm type conveyor	95 r. p. m.

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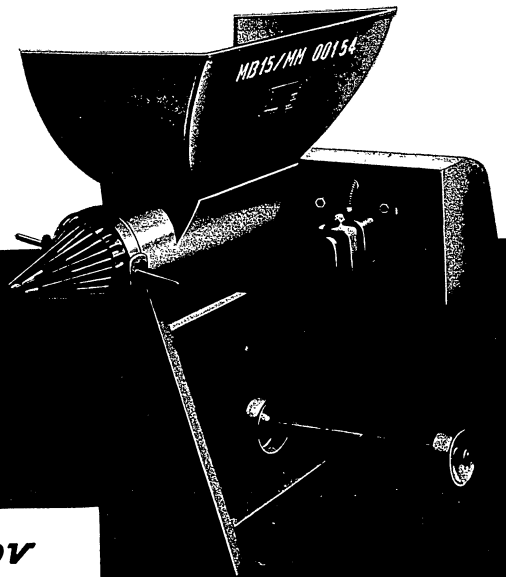

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SPECIFICATIONS

Overall length	3100 mm
Overall width	1150 mm
Overall height	1350 mm
Weight	250 kg
Number of interchangeable sieves	5
Electric motor	0,5 kW
Output with motor-drive	240 q/8 hr
Output when driven by hand-crank	100 q/8 hr

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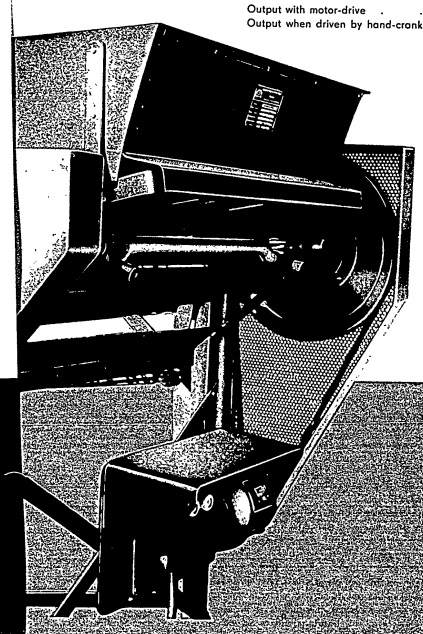

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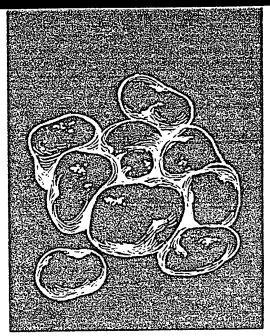
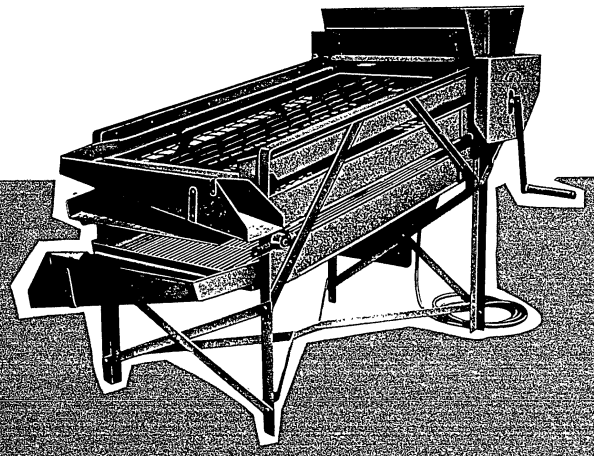
THE POTATO SORTING MACHINE





Harvesting of potatoes in autumn as well as the planting of them in spring will be made easier for you using the potato sorting machine. The swinging of the sorting sieves distributes the potatoes into 3 groups according to their size.

The machine is of all-metal structure which is coated with a paint of well impregnating compound. It is supplied either with an electric motor or without it. A grate, which is located behind the potato sorting mechanism proper, is designed for assorting of mechanically damaged potatoes. The speed of the potato sorting machine amounts to 250 r. p. m. In order to ensure a smooth running of the machine, this has to be installed in a horizontal position by means of a mounted water-level. All bearings are equipped with grease lubricators. The sorting sieves can be quickly interchanged.

The equipment of the potato sorting machine includes 5 sieves with meshes dia. 37, 45, 55, 70 and 90 mm.

SPECIFICATIONS

Overall length	1,235 mm
Overall width	2,880 mm
Overall height	1,220 mm
Weight	160 kg
Adjustment of bodies according to interrow spacings	60—70 cm
Output at a speed of 4 km/hr when ridging	1.3 ha/hr
Output at a speed of 4 km/hr when hilling	1.12 ha/hr

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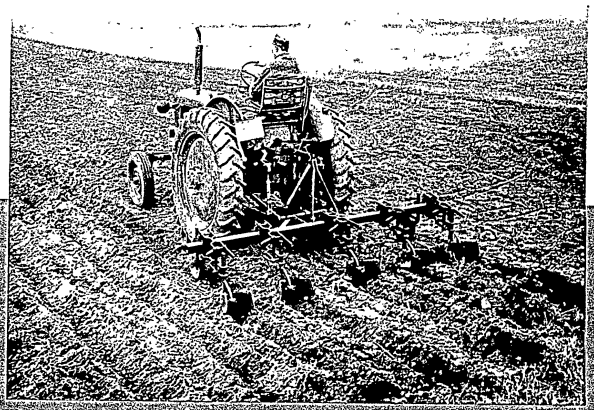

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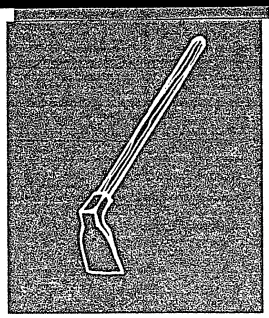
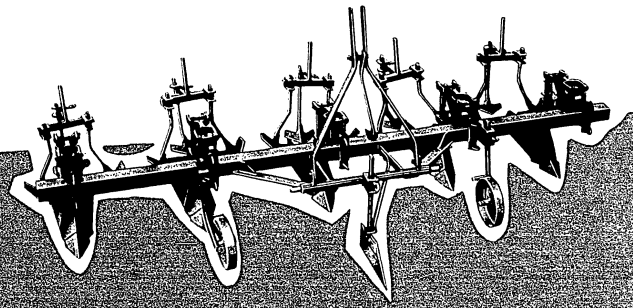
THE HN 41 MOUNTED RIDGER

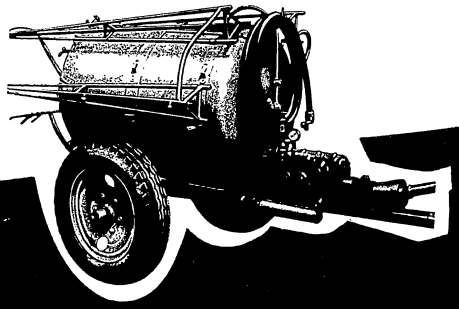




The HN 41 mounted ridger is a heavy-duty implement used for hilling row crops, ridging etc. The light, but very solid construction of this implement guarantees its long life. The HN 41 ridger is designed to be connected with the hydraulic power lift of the ZETOR 25 and ZETOR 25 K Diesel tractors. It works the soil, i.e. hills and ridges row crops in four rows. Five complete bodies can be adjusted for various inter-row spacings within the limits of 60—70 cm. The working depth of the implement can be controlled by means of two adjusting wheels and by changing the relative angles of the ridging bodies which are adjustable on the links of the parallel link double arm suspensions. The frame is equipped with two supporting wheels, which follow the trace of the rear tractor wheels. A coulter, which is located in front of the centre body, prevents the implement from lateral deviations. Both wings of the ridging body are laterally as well as vertically adjustable.

The ridger is made of high quality material; the centre breasts, the wings and the shares of the ridging bodies are manufactured of steel sheet. The implement is designed for use with the ZETOR 25 or ZETOR 25 K Diesel tractor.

TRACTOR-DRAWN SPRAYER P 900



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P 900

TECHNICAL DATA

Machine width when wheel gauge is adjusted at 1180 mm	1460 mm
Machine width when wheel gauge is adjusted at 1430 mm	1610 mm
Machine width in working position with nozzle frame	10000 mm
Machine height in working position	1640 mm
Machine length in working position	2880 mm
Machine length in working position with folded nozzle frame arms	3710 mm
Machine weight when empty	570 kg
Machine weight when full	1430 kg
Pump capacity	35 l/m
Revolutions of tractor drive	510 r./m.
Spraying liquid consumption when applying horizontal spraying frame per 1 hectare	234—746 l
Spraying liquid consumption for two handsprayer nozzles	2.75—12.55 l/m

Owing to a constant development in construction all the abovementioned data and illustrations are not to be considered as binding.

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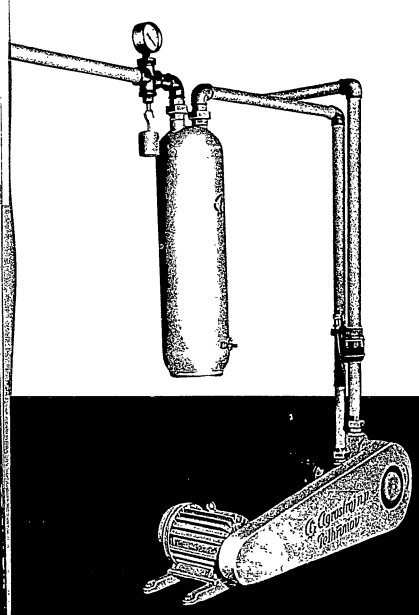
DT 1

TECHNICAL DATA

Weight of single-unit milker	10.60
Weight of airlift pump	75.—
Driving input of airlift pump	1,7 kW
r. p. m.	500
Conveyed quantity at under-pressure of 38 cm Hg	600 litres
Electromotor	2,2 kW—220/380 V
Diameter of under-pressure and stable piping	1.5"
Diameter of airlif exhaust piping	2"
Number of cans with pulsators	10



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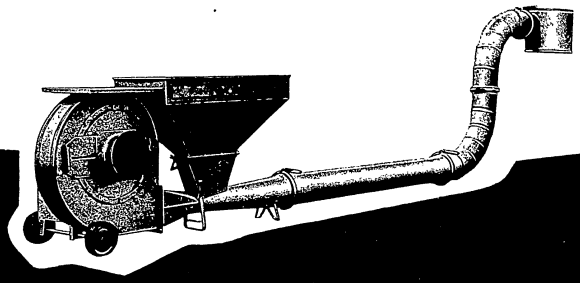
DT 1 MILKING UNIT

GRAIN BROADCASTER Z 3



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Z3A

TECHNICAL DATA

Machine length	2250 mm
Machine width	800 mm
Machine height	1000 mm
Machine weight	320 kg
Fan wheel diameter	600 mm
Piping diameter	225/230 mm
Working capacity at 40 m distance and 10 height	4000 kg/h
Electromotor	660/380 V
Engine input	11 KW
r. p. m. of engine	2800/1 m

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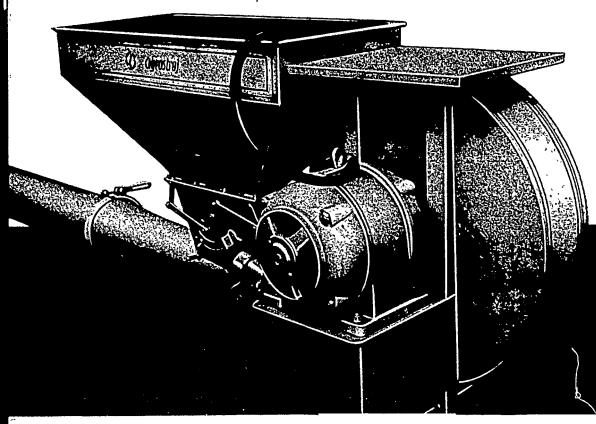

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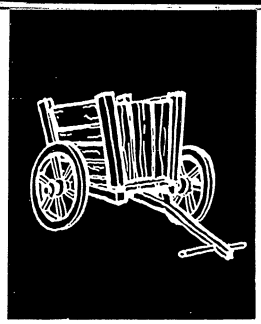
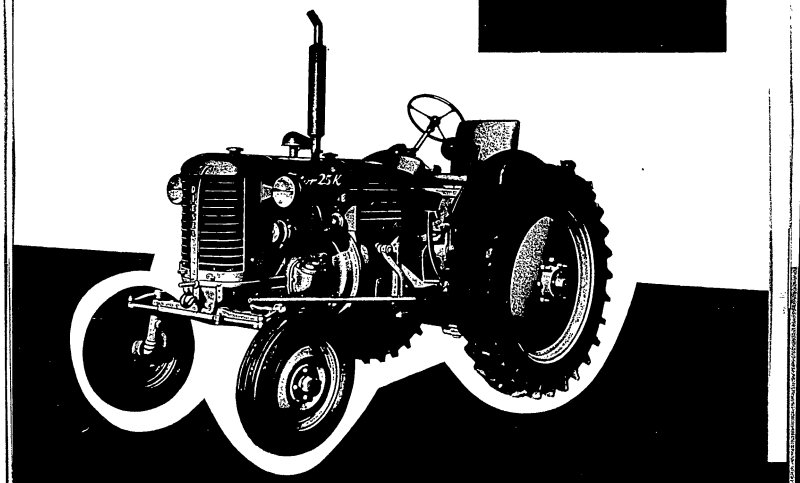
THE ZETOR 25 K ROW CROP TRACTOR





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SPECIFICATIONS

Piston stroke	120 mm
Cylinder bore	105 mm
Swept volume (piston displacement)	2,078 cm³
Power output (engine speed)	24 H. P./1,600 R. P. M.
Number of cylinders	2
Compression ratio	1 : 18
1st forward speed	4.— km/hr.
2nd forward speed	5.2 km/hr
3rd forward speed	6.7 km/hr.
4th forward speed	11.— km/hr
5th forward speed	14.4 km/hr.
6th forward speed	18.6 km/hr.
1st reverse speed	2.7 km/hr.
2nd reverse speed	6.3 km/hr.
Front wheel tread (variable)	1,220—1,540 mm
Rear wheel tread (variable)	1,150—1,460 mm 1,410—1,720 mm
Wheel base	1,900 mm
Overall width	1,965 mm
Overall length	3,200 mm
Overall height up to top edge of exhaust pipe	2,207 mm
Total weight including fuel, water and oil	1,970 kg
Ground clearance of front axle	520 mm
Minimum ground clearance	465 mm
Rear wheel tyres	9.00—36
Front wheel tyres	5.50—16
Minimum turning radius	5.8 m
Fuel tank capacity	45 l

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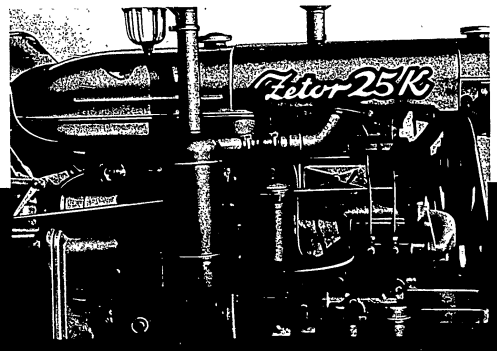

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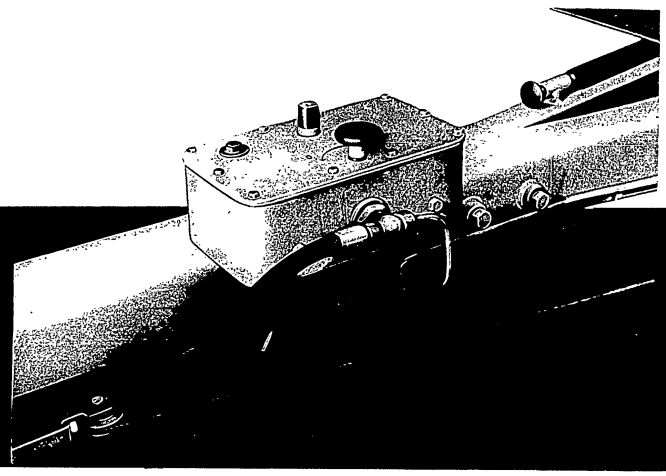
DP - 2,5 S

SPECIFICATIONS

Capacity	2,500 kg.
Own weight	approx. 870 kg.
Wheel gauge	1,250 mm.
Tyres	8.25×15
Discs	8"×15
Electrical equipment	according to safety regulations
Box	3,000×1,600×400 mm.
Loading platform height	approx. 950 mm.
Speed	20 km p. hr.

As our products are continuously being improved upon the specification and illustrations should not be regarded as binding.



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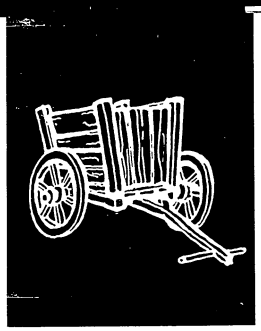
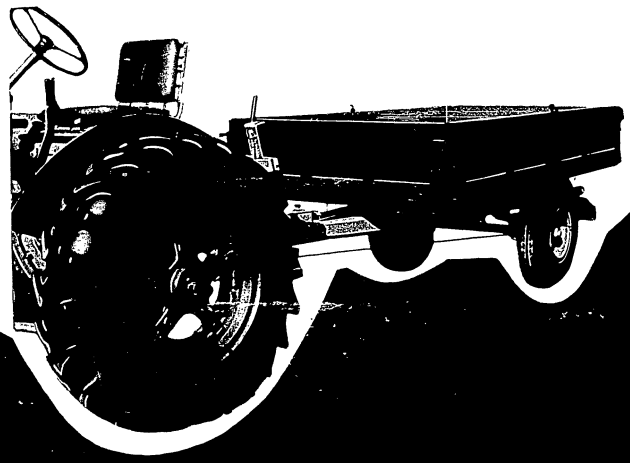
DP-2,5 S TWO WHEEL TRACTOR TRAILER





FERTILIZER SPREADER FOR MANURING WITH ANHYDROUS AMONIAC

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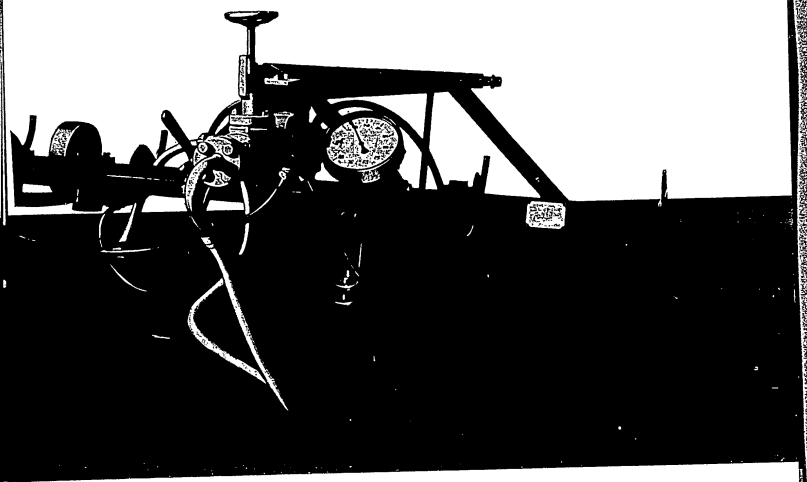
TECHNICAL DATA

Total machine length	3800 mm
Total machine width	2870 mm
Total machine height	1600 mm
Weight of trailer together with tank, incl. about 500 l of amoniac	840 kg
Weight of mounted implements with armature	170 kg
Tank volume	335 l
Tank air space	7 %
Working width	2700 mm
Min. radius of rotation	3 m
Depth of injecting amoniac into the soil	10—13 cm
Working speed	5—6,4 km/h
Machine capacity in 8 hours	8—14 hectares (according to the character of terrain)

The fertilizing shares are adjustable, enabling any kind of control.
The six-piece distributor ensures a symmetrical distribution.
Distribution is governed by a regulating needle valve by directing the passing pressures over a control pressure — gauge.
Owing to a constant development in construction all the above-mentioned data are not to be considered as binding.



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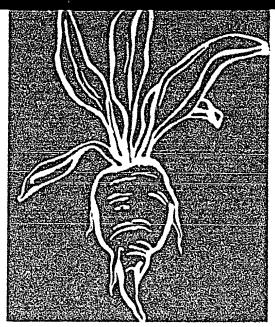
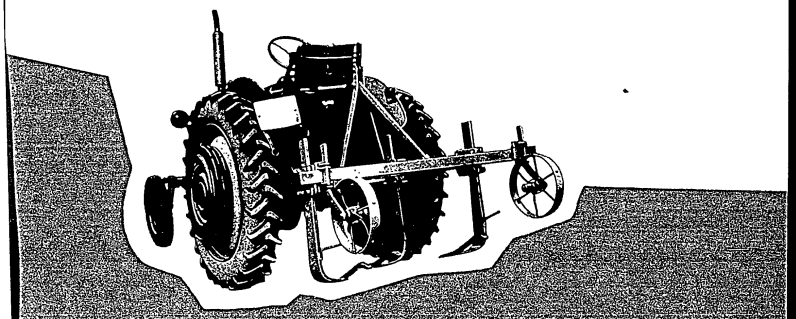
THE VRN 3 MOUNTED BEET LIFTER

THE VRZ 3 TRACTOR-DRAWN BEET LIFTER





The VRN 3 mounted beet lifter, which is attached to the hydraulic power lift of the ZETOR 25 Diesel tractor, lifts 3 beet rows simultaneously. The implement is provided with 3 powerful lifting shares. The working depth is controlled by means of 2 adjusting wheels. The lifting shares can be adjusted for various inter-row spacings within the limits of 40—50 cm.

The same implement, when attached to the ZPN tractor-drawn forecarriage for interchangeable implements, forms a new working unit — the VRZ 3 tractor-drawn beet lifter. Owing to this fact, the beet lifter can be used even by farmers who do not possess a tractor with hydraulic power lift. The tractor hitch can be attached to the drawbar of a tractor in any distance from the ground. The forecarriage can be adjusted for the required working depth. It is provided with extra wide rims to prevent the wheels from sinking in.

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VRN 3, VRZ 3

SPECIFICATIONS

Overall length of beet lifter	1,600 mm
Overall width of beet lifter	1,700 mm
Overall height of beet lifter	1,155 mm
Number of lifting shares	3
Number of rows	3
Inter-row spacing	40—50 cm
Approximate weight of beet lifter	200 kg
Output at a speed of 5 km p/h	0.35 ha
Overall length of forecarriage	1,755 mm
Overall width of forecarriage	1,640 mm
Overall height of forecarriage	1,115 mm
Approximate weight of forecarriage	240 kg

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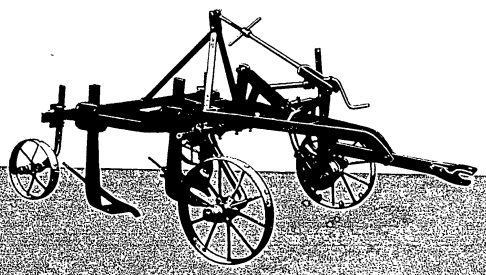

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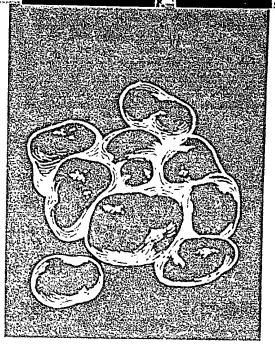
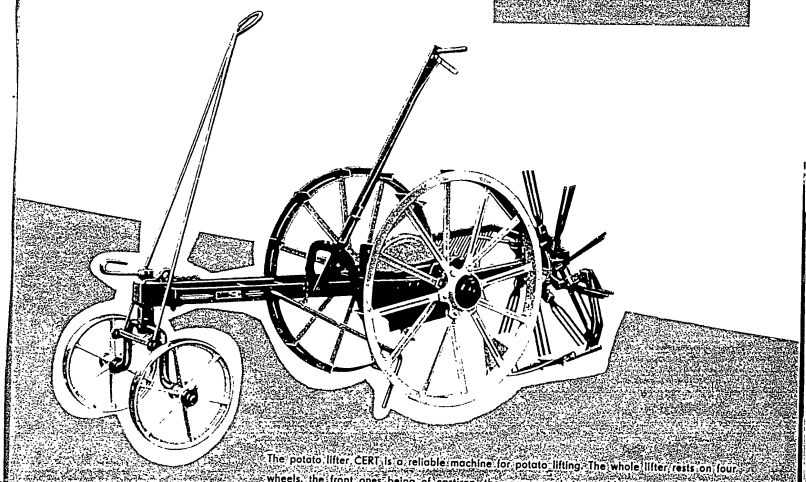
ČERT
POTATO LIFTER





The potato lifter, ČERT, is a reliable machine for potato lifting. The whole lifter rests on four wheels, the front ones being of castiron, the rear ones being welded. The share, fixed to the handle, can be adjusted by means of an adjusting lever, and governed by means of a hand lever; this contrivance prevents the cutting of potatoes into two. If good lifting is required, then a proper adjustment of the share is necessary. For transporting the lifter on to the field the lifter is equipped with a pole which is removed before starting operation and the machine is attached to a traction hook to which then may be hitched the distance-pieces and the balancing contrivance. The transmision gear is fitted in an oil-bath box. The spreading disc is started by lifting the adjusting lever. The wheel guage may be changed by shifting the bearing wheels. The lubrication is by pressure lubricators.

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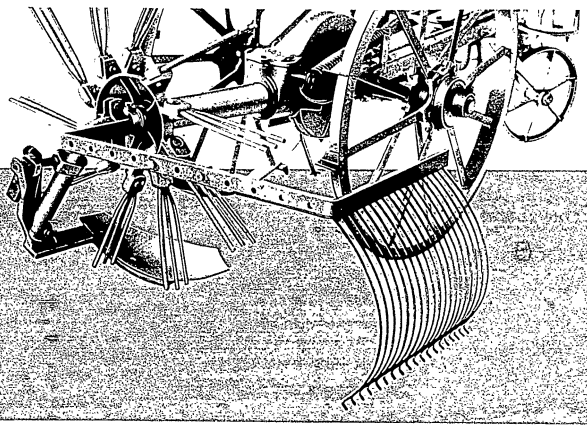
TECHNICAL DATA

Length	2620 mm
Width	1000 mm
Height	1100 mm
r p. m. of spreading disc at 4 km/h speed	87/min
Wheel gauge in normal adjustment	590 mm
Wheel gauge in enlarged adjustment	720 mm
Machine weight	280 mm

Drive from main wheels shaft.

Owing to a constant development in construction all the above-mentioned data and illustrations are not to be considered as binding.



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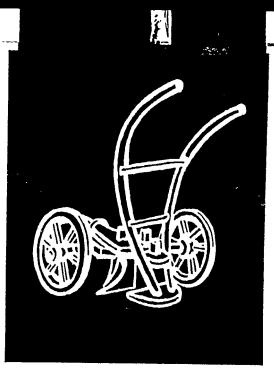
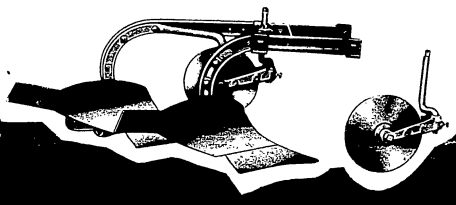
THE U 27 ATTACHMENT





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MARS U 27

SPECIFICATIONS

	Without forecarriage	With forecarriage
Overall length	1600 mm	2890 mm
Overall width	950 mm	1530 mm
Overall height	630 mm	1280 mm
Ground clearance below frame	535 mm	
Longitudinal spacing of bottoms (in direction of movement of tractor)	500 mm	
Cutting width of one bottom	25 cm	
Total working width	50 cm	
Maximum working depth	22 cm	
Weight of attachment with accessories	140 kg	330 kg
Draft required on hook at specific soil resistance of 60 km/dm² (maximum working depth)	660 kg	
Approx. performance at 5 km/hr speed	0,23 ha/hr	

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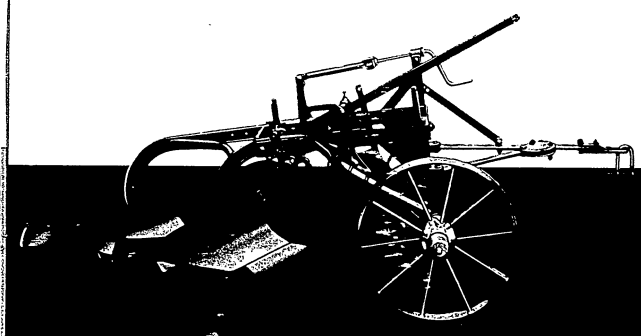

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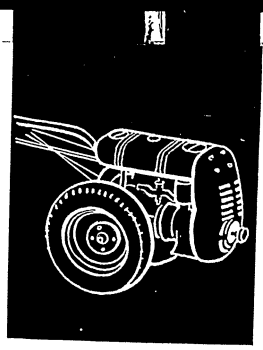
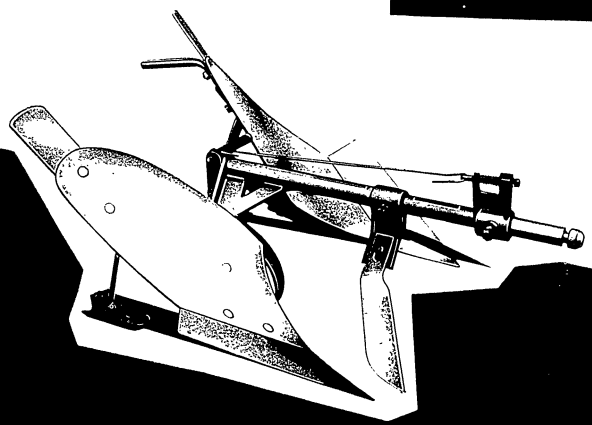
THE POM 25 REVERSIBLE PLOUGH





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POM-25

SPECIFICATIONS

Weight	52 kg
Working width	250 mm
Maximum working depth	210 mm

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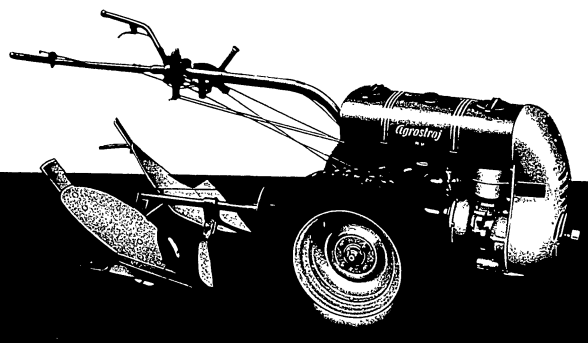


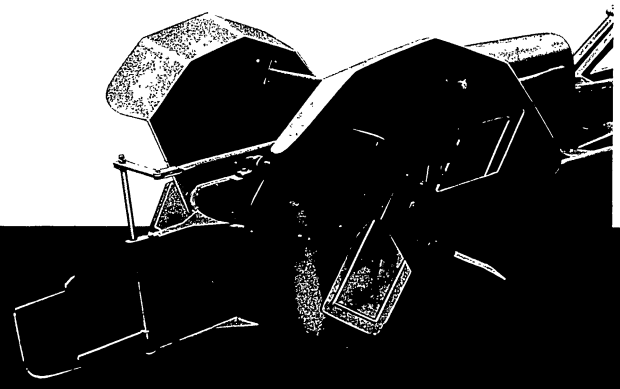
MOTOKOV
PRAHA - CZECHOSLOVAKIA

ESOX M 2

TECHNICAL DATA

Length	3500 mm
Width	1150 mm
Height	400 mm
Petrol engine power	5,5 HP
Horizontal bar length	1630 mm
Weight	350 kg
Draught when laden with one person	150 mm
Capacity per 8 hours	0,5 ha

Owing to a constant development in construction all the abovementioned data and illustrations must not be considered as binding



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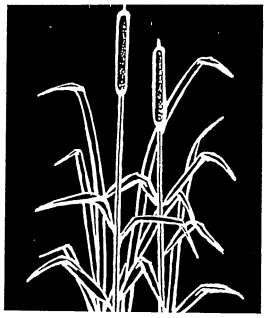
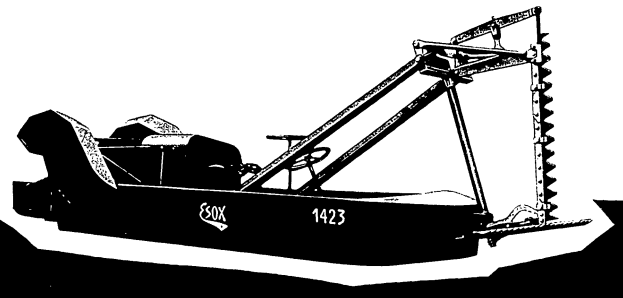
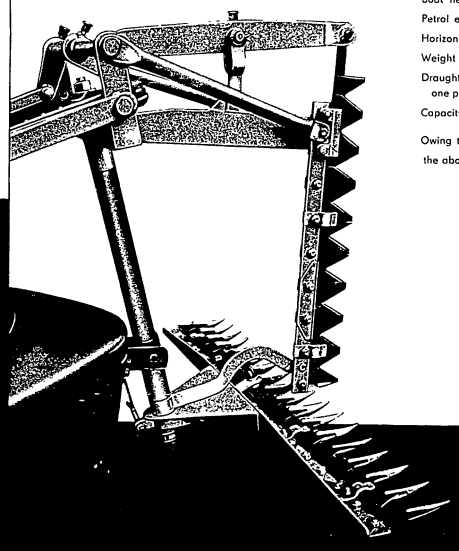
THE ESOX M 2
WATER WEED LAUNCH





ESOX M



TECHNICAL DATA

Boat length	1800 mm
Boat width	1000 mm
Boat height	400 mm
Petrol engine power	5,5 HP
Horizontal bar length	1120 mm
Weight of the cutter	180 kg
Draught of the boat when laden with one person	150 mm
Capacity per 8 hours	0,3 ha

Owing to a constant development in construction, all the above-mentioned data and illustrations are not to be considered as binding.

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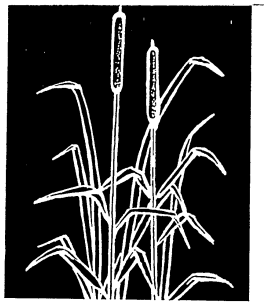
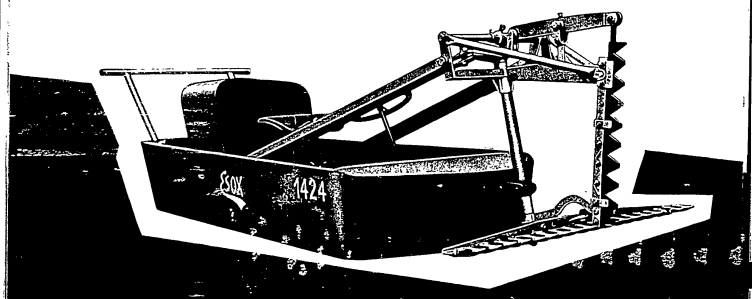
THE ESOX M WATER WEED LAUNCH



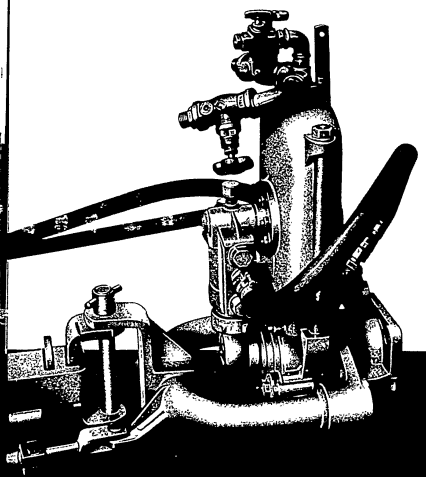


PM-200

ing in hop-gardens, vineyards, etc.). If trees in orchards have to be sprayed, the boom must be replaced by the hand lances with rubber hoses mounted on to the fittings of the delivery valves. The standard accessories of this implement include 1 boom with spraying nozzles, 2 complete lances 2000 mm long with nozzles, 2 short lances, rubber hoses with connecting fittings (each hose is 10 m long).

SPECIFICATIONS

Overall length	2600 mm
Overall width	1140 mm
Overall height	850 mm
Weight	220 kg
Fluid tank capacity	200 l



Pump: double-action piston pump, bore 45 mm, stroke 35 mm, capacity at 350 r. p. m. = 28 l of sprayed fluid/min.

Average output: when crops are sprayed 0,8 ha/hr when spraying trees 180—350 trees/hr

Fluid consumpion . . . . . 525–600 l/hr

As we are constantly improving and developing the construction and design of all our machines and implements, no specifications or illustrations should be regarded as binding.

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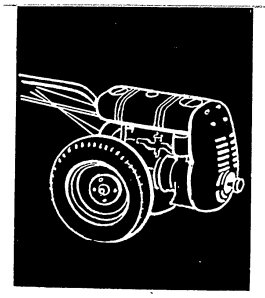
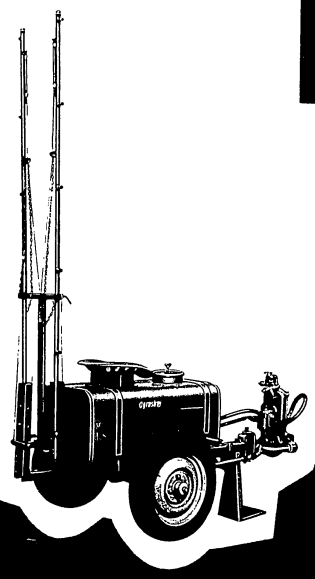
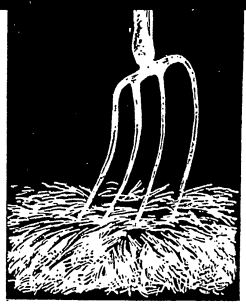
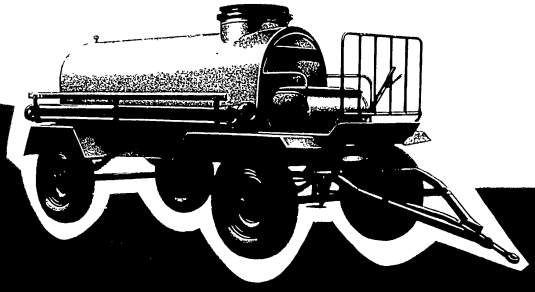
THE PM 200 SPRAYER





EXPLOSION TYPE SELF-CHARGING TANK WAGGON





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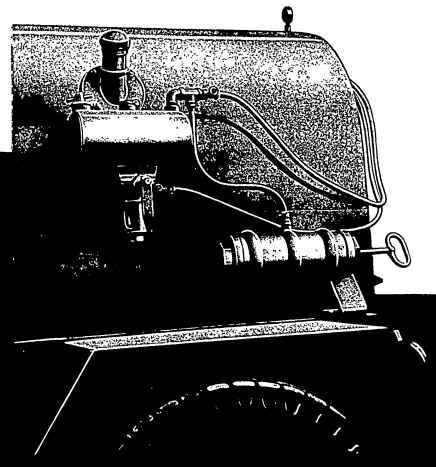
SPECIFICATIONS

Overall height	2140 mm
Overall width	1800 mm
Overall length without pole, including hitch	5570 mm
Total weight including accessories	1830 kg
Pneumatic tyres (4)	7.5—20"
Nominal vacuum	0.548 atm.
Mean effective vacuum	0.53—0.57 atm.
Tank capacity	4.430 m^3
Capacity effectiveness	45.1 %
Head	13.1 m
Overall length of hoses	12 m
Wheel tread	1625 mm
Wheel base	2750 mm
Ground clearance of truck	350 mm
Brakes: 1. internal expanding hand brakes of double-shoe type	2
2. internal expanding automatic brakes of double-shoe type, specified for trailers	2

As we are constantly improving and developing the construction and design of all our machines and implements, the specifications and illustrations should not be regarded as binding.



MOTOKOV
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PP 23

SPECIFICATIONS

Wheel track	660 mm
Pneumatic tyres	BANTAM 16×4
Distance between wheel axle and front pin	1160 mm
Weight	72 kg

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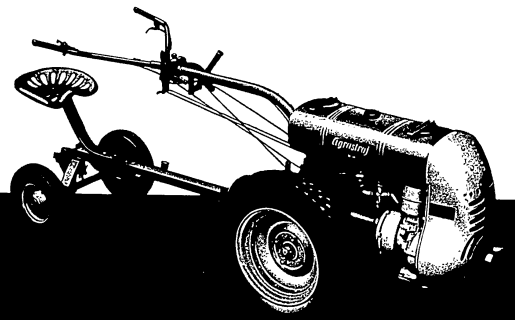

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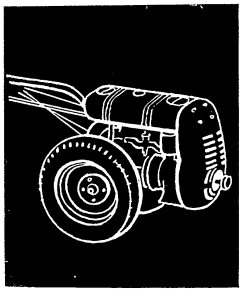
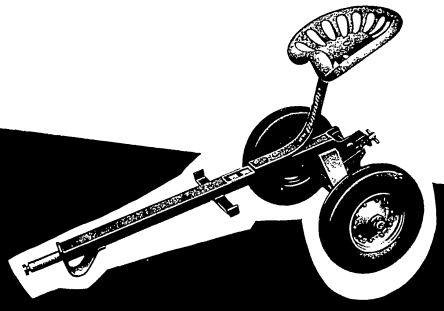
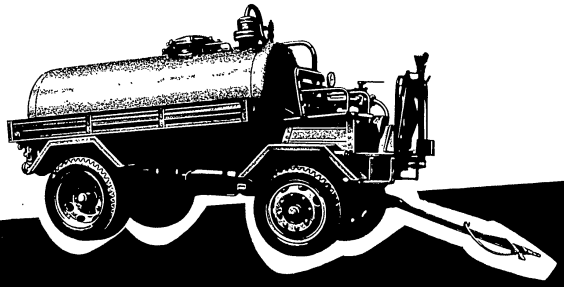
THE PP 23
RIDING SULKY





THE FPT 2.5 SEWAGE
WATER TANK WAGGON



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FPT-2.5

SPECIFICATIONS

Overall length	5,600 mm
Overall width	1,826 mm
Overall height	2,400 mm
Wheel base	2200 mm
Maximum permissible load	5,610 kg
Wheel tread	1,350 mm
Compressor model	IK—70/70
Compressor type	Rotary
Compressor speed	1,440 R. P. M.
Compressor output	200 m³/hr.
Maximum overpressure	2 atm.
Maximum vacuum	8.5 cm of water column
Period of charging tank with water at suction head of 1.5 m	3 min.
Pneumatic tyres	6.50—20 or 6.00—20
Required pulling strength	tractor of about 30 H. P.
Weight of empty tank waggon	2,600 kg
Weight of fully charged tank waggon	5,200 kg

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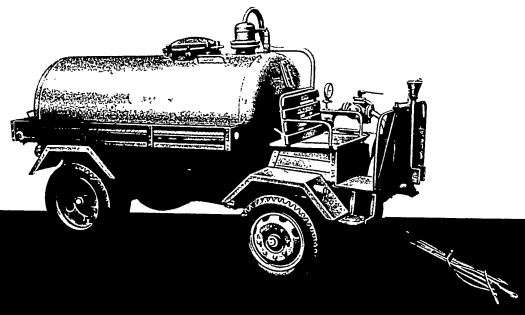

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NH 100

SPECIFICATIONS

Weight	820 kg
Tank capacity	40 l
Pressure	60 atm.
Grab capacity	0.2 m³
Working cycle	50 sec.
Road speed	15 km/hr.

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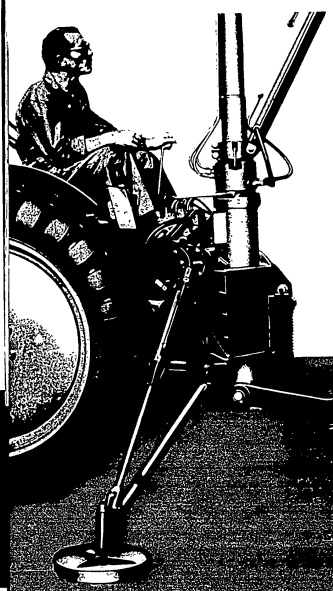

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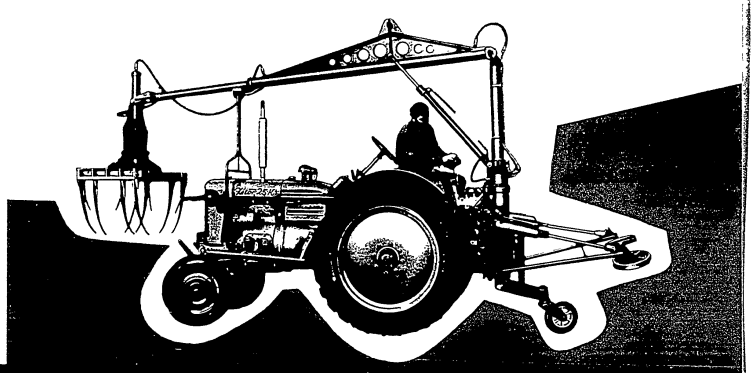
THE NH 100
HIDRAULIC LOADER

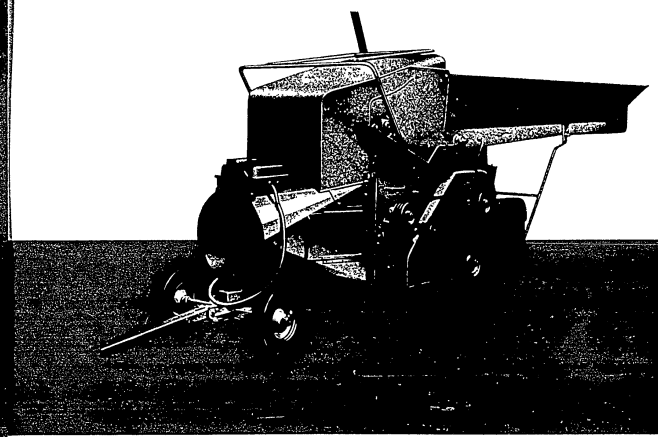


VK 25

TECHNICAL DATA

Operating length	4750 mms
Transport length	3000 mms
Width	1260 mms
Height	1560 mms
Length of detachable conveyor	3000 mms
Width of detachable conveyor	1230 mms
Axle wheelbase	2000 mms
Track	600 mms
Ground clearance	165 mms
Dimension of bantam tyre	16×4 mms
Diameter of ventilator wheel	600 mms
Revolutions of ventilator	1200 r. p. m.
Diameter of crusher drum	360 mms
Width of crusher drum	800 mms
Diameter of pipeline	500 mms
Transport distance	35 m
Transport height	7 m
Approx. output (dry fodder)	2500 kg. p. h.
Input (according to transport distance and kind of crushed material)	7,5—9 kW
Weight	700 kg

In view of constant development the data and illustrations must not be considered as binding



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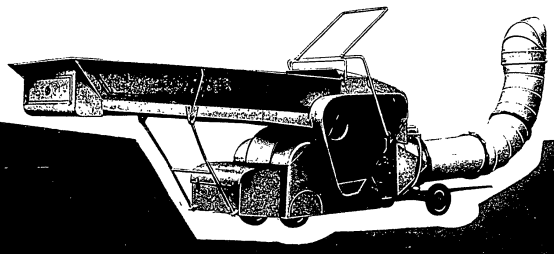
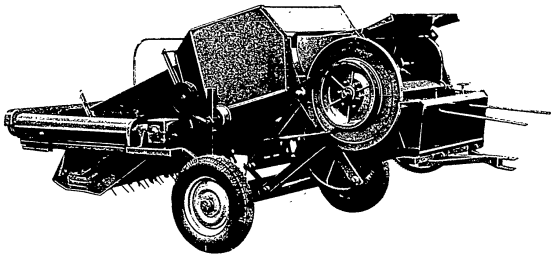
THE VK 25
COMBINED HAY BLOWER AND CRUSHER



THE SLK-130
TRACTOR-DRAWN
PICK-UP BALER



The SLK 130 pick-up baler picks up and bales dry straw left on the field after harvesting with a combine, or picks up fodder raked into windrows and ties it in bales which are subsequently conveyed along sliding rails into a trailer. The baler is hitched behind a tractor from which it is driven by means of the P.T.O. shaft; it can be successfully used when handling areas having an extent of more than 1 ha. The SLK pick-up baler is a well-proved machine which is able to satisfy even the requirements of a highly pretentious farmer.

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SPECIFICATIONS

Working width	130 cm
Width of throat	1,000 mm
Height of throat	300 mm
Adjustable length of bales	350—450—550 mm
Weight of bales	approx. 8—12 kg
Output	0.5—1 ha/hr
Number of plunger strokes/min.	45—50
Speed of flywheel	220—260 RPM
Number of binders	1
Wheel tread	2,045 mm
Tyres	6.00—16
Turning radius	7,000 mm
Speed of driving P.T.O. shaft	540 RPM
Overall length	5,700 mm
Overall width	2,200 mm
Overall height	1,750 mm
Weight	1,400 kg

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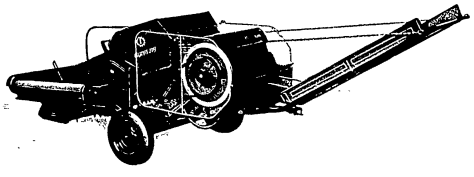

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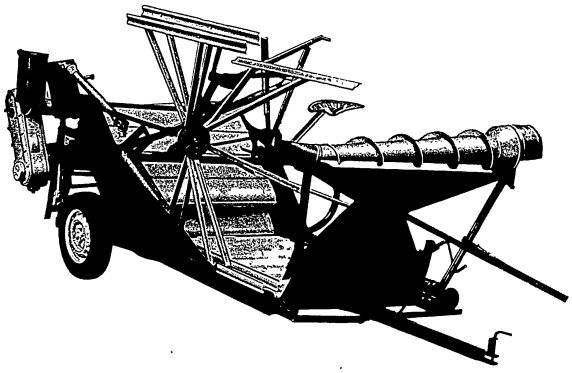
ST 01-31685-59

THE ŽVZ 213 TRACTOR BINDER



The 2VZ 213 tractor binder represents a new binder type of the Czechoslovak production. All up-to-date notions of the farm machinery production research have been taken into consideration when designing this machine which is, therefore, really able to satisfy even the most pretentious requirements. The name of this machine indicates that it is designed for reaping and binding cereal crops. In contradistinction to the existing types of binders this implement is provided with a left-hand cutter bar and has a working width of 213 cm. Sturdiness and rigidity of this binder are enormous as compared with its low weight; the reason of this fact consits in the construction of the main frame which is made of angular sections and four-edged tubes. All gears are enclosed in oil baths and the rotating components run on ball and roller bearings or on self-oiling bearings. The cutting mechanism is of the combine type with grooved knife sections which need not be ground during the whole season. The reel can be easily operated from the driver's seat and two of its arms are tiltable in order to facilitate transport of the machine. The elevator canvases are made of perlon, impregnated and connected together by means of a rubber rope this enabling to handle even moist crops. The straps of canvases which are made of novodur are well laced down in order to eliminate their loosening and breakage. A worm type crop divider guarantees reliable operation of the machine even in entirely lodged cereal crops. The knotter runs in an oil bath. The binder can be disassembled quite easily without using any tools. The working hitch can also be used as a transport hitch. The 2VZ 213 tractor binder is delivered in four types the working width of which amounts to 152 cm, 183 cm, 213 cm and 244 cm.

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SPECIFICATIONS

Working width	213 cm
Working speed	7 km/hr
Transport wheel with tyre	7.00—15
Field wheel with tyre	5.50—15
Number of ball bearings	42
Overall length	4,000 mm
Overall width	2,200 mm
Overall height	2,300 mm
Weight	850 kg
Output	1.5 ha

Specifications of binder with different working width:

Type	Working width in cm	Overall length in cm	Overall width in cm	Overall height in cm	Weight in kg	Output in ha/hr
2VZ 152	152	340	220	230	790	1.1
2VZ 183	183	370	220	230	820	1.3
2VZ 213	213	400	220	230	850	1.5
2VZ 244	244	430	220	230	880	1.7

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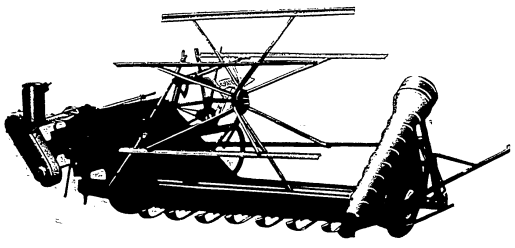

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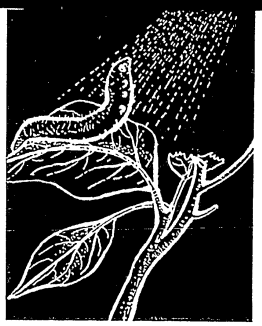
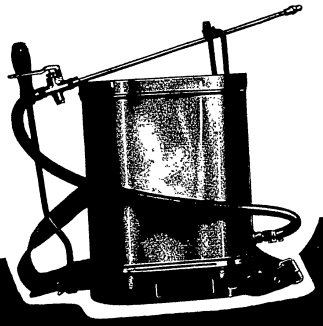
HAND-OPERATED SPRAYER-TYPE 9





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TECHNICAL SPECIFICATION

Length	245 mm
Width	185 mm
Height	455 mm
Weight	9 kg

With regard to development the above data and illustrations are not to be regarded as binding

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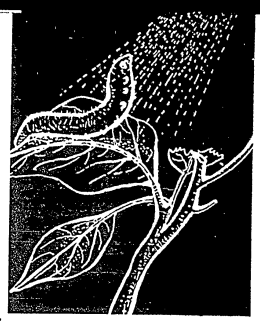
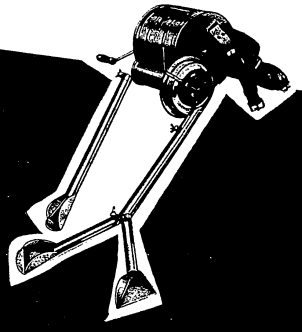
ST 01-30060-59

HAND-OPERATED DUSTING APPARATUS-TYPE PULVIS





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PULVIS

TECHNICAL SPECIFICATION

Length	300 mm
Width	500 mm
Height	400 mm
Weight	7.5 kg
Capacity of container	15 litres
Width of dusting	750 mm
Output	approx 0.3 ha/p.h

With regard to development the above data and illustrations are not to be regarded as binding.

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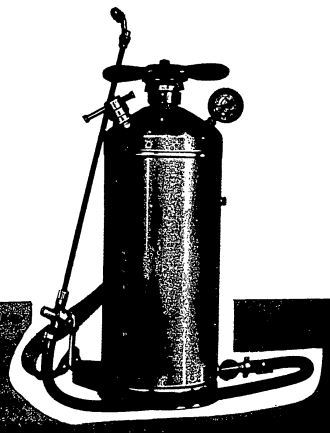
ST 01 30059-59

PRESSURE SPRAYER-
TYPE 2



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TECHNICAL SPECIFICATION

Width	280 mm
Height	640 mm
Weight	10 kg

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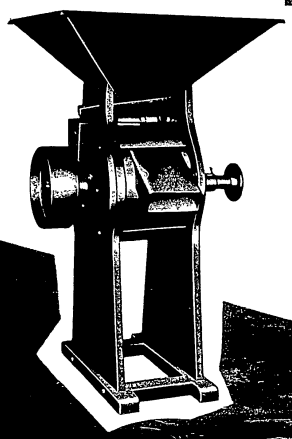
THE ROBUR SHREDDING MILL



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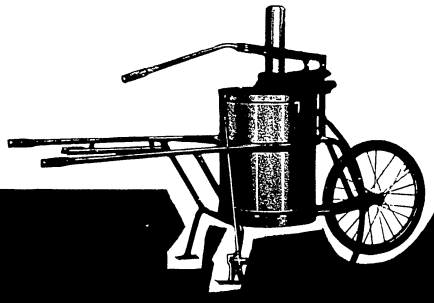
ROBUR

WHEEL-BARROW SPRAYER No. 3



SPECIFICATIONS:

	ROBUR 300	ROBUR 400
Required power input of electric motor	4 kW	6 kW
Output	250 kg/hr	400 kg/hr
Service life of grinding stones	15—18 waggons	20—25 waggons
Diameter of grinding stones	300 mm	400 mm
Pulley diameter	250 mm	330 mm
Overall dimensions	720/720/1,370 mm	800/800/1,450 mm
Speed of grinding stones	900 RPM	700 RPM
Gross weight	105 kg	145 kg

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TECHNICAL SPECIFICATION

Length	1800 mm
Width	550 mm
Height	900 mm
Weight	31 kg
Capacity of container	40 litres

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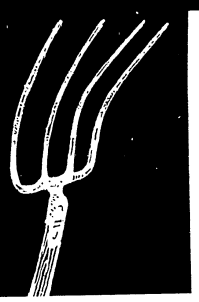
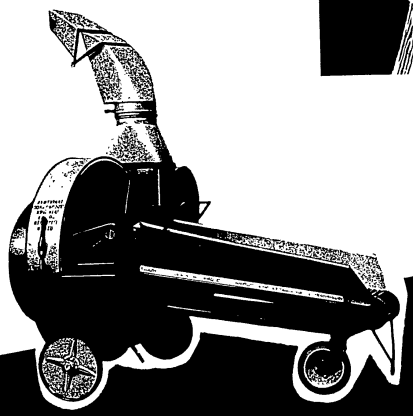
ST 01 - 21662 - 59 1

BLOW-AWAY CHAFF CUTTING-MACHINE WITH FAN-TYPE ŘVM-37





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ŘVM 37

TECHNICAL SPECIFICATION

Overall length of machine		2500 mm
Overall width of machine		1790 mm
Overall height of machine		1740 mm
Weight of machine	approx	400 kg
Speed of tool wheel		300 r p.m
Length of chaff 12, 20, 30 and 50 mm, on special request		6 and 100 mm
Output of machine per hour		4000 kg of grass fodder 1400 kg of stall-feed

Stall-feed is blown to the distance of 25 m

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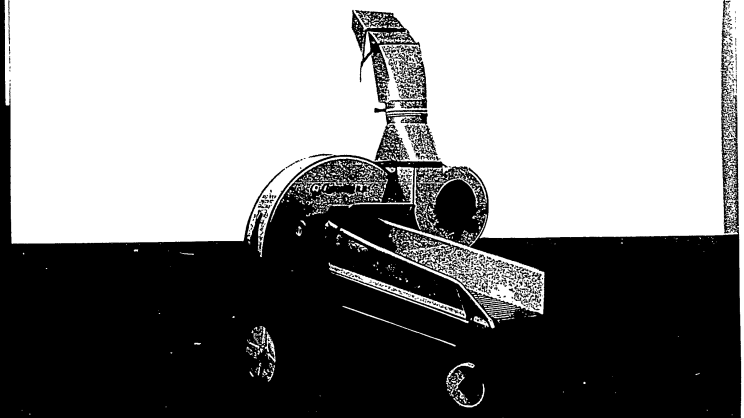

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ST 01 30247 - 59 a

SPECIFICATIONS:

Type	Horse-drawn, for a horse-team
Working width	138 cm
Overall length including pole	5,070 mm
Overall length without pole	2,580 mm
Overall height	1,670 mm
Overall width	1,680 mm
Wheel tread	1,200 mm
Weight approx.	300 kg
Wheels with tyres	6.00—16
Caster wheel BANTAM	4.00—16

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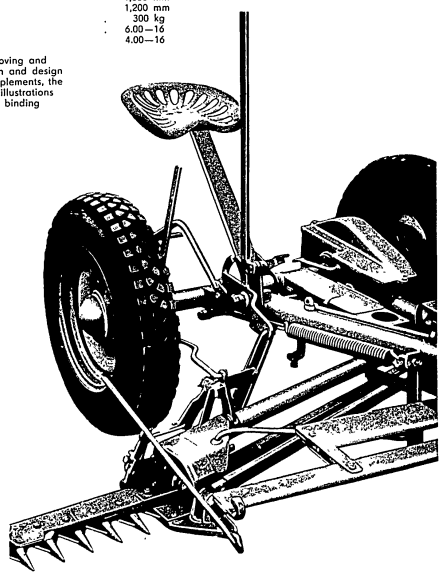

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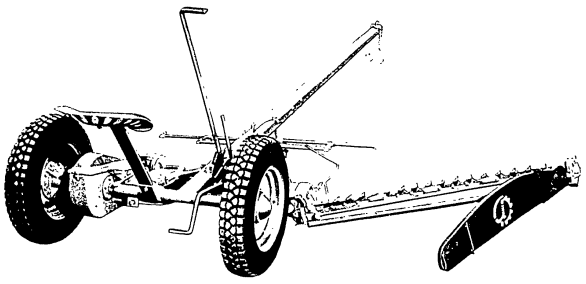
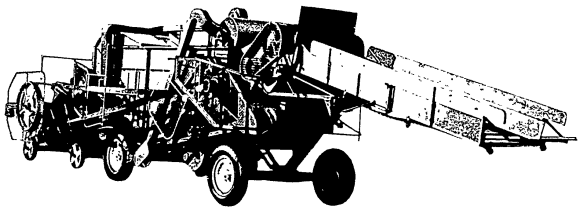
THE ŽT 138 HORSE-DRAWN GRASS MOWER



This mower, which is intended for cutting grass, is operated with a horse-team and is provided with a crank-type pole and a caster wheel. The implement is of unit-construction, i.e. it is composed of several separate units. One unit is formed by the machine frame which is made of welded angular sections. The cutter bar is af medium-cut type and is provided with a sheet-iron swath divider. The knife is driven from the main wheels axle by means of transmission gears. The gears as well as the eccentric run on five ball bearings. The cutter bar is lifted and lowered by means of a hand lever and a foot-operated pedal. The mower is further equipped with a double-arm lever for engaging and disengaging the driving mechanism of the cutter bar. Pneumatic tyres reduce the vibration and prolong the service life of the whole implement. The pawl discs, which are easily accessible, are properly shielded against any dirt. The implement is provided with an up-to-date cutting mechanism of the low swath-cut type with scrapers. The cutter bar is very advantageously arranged so that clogging is eliminated even under the most difficult working conditions; the cutter bar remains quite clean on its bottom as well as top part. The height of stubble is controlled partly by two vertically adjustable shoe soles, partly by adjusting the cutting angle of the cutter bar by means of a hand lever. The implement is lubricated by means of grease nipples.

THRESHING MACHINE TYPE MAR 90



The MAR 90 threshing machine is a highly efficient type complying with modern requirements, for whose servicing only 3—4 operators are necessary. The machine has a steel framework lined with galvanized sheet. The threshing machine is provided with an automatic conveyor feeder, a volume and speed regulator, a cutter of binders, and a directing feed drum, as a result of this arrangement whole uncut sheaves can be put into the thresher. The trough of the automatic feeder is adjustable for height; this circumstance facilitates work when sheaves are thrown into the automatic feeder from a cart. The threshing drum is made of steel, provided with three supporting crosses and two circular braces. It is equipped with 10 grooved threshing tools. The threshing steel cage consists of two parts and is adjusted at both sides simultaneously by one control lever. The hummelling drum consists of four parts. The shaking contrivances consist also of four parts and are provided with sheet grates. Dust from the space of the shaking contrivances and of the 2nd cleaner is automatically exhausted. The threshing machine is equipped with two cleaning systems, with an ear finishing thresher, an ear exhaustor and a separating trier. The chaff and straw litter are conveyed directly on a dump through the exhaust.

As mentioned above, the threshing machine is of an all-metal type with a rigid welded framework. The travelling wheels are provided with tyres and fitted in anti-friction bearings. The wheels of the rear axle are fitted with shoe brakes. The threshing machine is transported by means of a tractor and is therefore provided with a short suspension shaft. It is driven by a built-in electric motor provided with starting and change-over equipment. The threshing machine can be also driven by any stationary motor of the corresponding output.

The MAR 90 threshing machine is used for threshing of all kinds of grain, legumes and oleaginous produce. By mounting a clover sheller the MAR 90 type of thresher is converted into the MARJ 90 type. This type, in addition to the work performed by the MAR 90 type, threshes clover from straw and at the same time shells clover seed from heads

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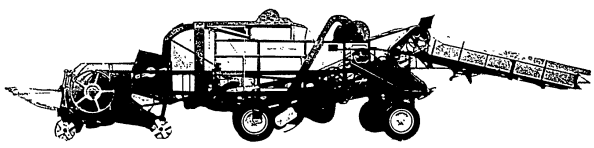
TECHNICAL SPECIFICATION

	MAR 90	MARJ 96
Working length	9750 mm	9750 mm
Transport length	7950 mm	7950 mm
Working width	2460 mm	2460 mm
Transport width	2460 mm	2460 mm
Working height	2960 mm	2960 mm
Transport height	2860 mm	2860 mm
Weight approx	3800 kg	4000 kg
Threshing drum, dia	550 mm	
Threshing drum, width	900 mm	
Threshing drum, speed	1200—1180 r p.m	
Gauge of steering wheels	1900 mm	
Gauge of braking wheels	1950 mm	
Axle base	3190 mm	
Tyres	6,50—20	

Electric motor	25 kW at 2950 r p.m for A.C 380/220 V, with oil starter 25 kW, change-over switch of run 500 V/60 A, and static condenser 8 KVAr 3 × 380 V
Standard output	25 q/p.h for wheat of productivity = 43.5 % and moisture of grain = 16 %

With regard to continuous development of the machine the above data and illustrations are not to be regarded as binding



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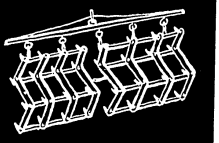
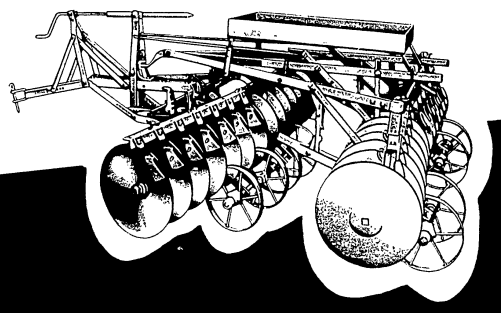
THE NTB 28
DISC HARROWS





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NTB 28

SPECIFICATIONS

Overall length	3140 mm
Overall width	2460 mm
Overall height	970 mm
Diameter of discs	450 mm
Number of discs	28
Total working width	2240 mm
Weight	530 kg
Performance at a speed of 5 km/hr	1 1 ha/hr

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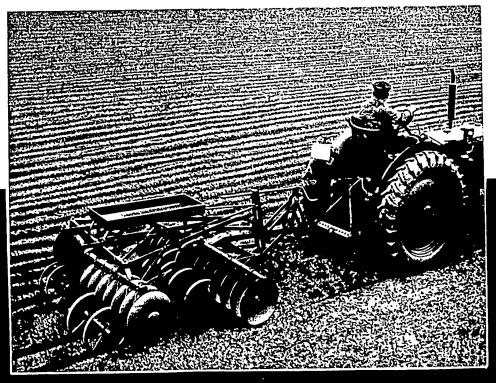

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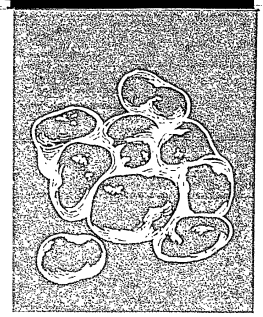
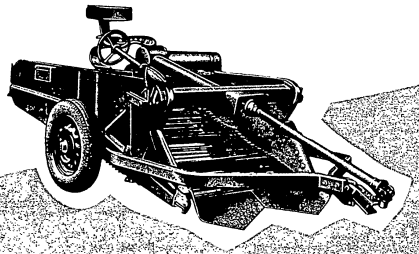
Sčs 01-31138-57-a

DOUBLE-ROW POTATO LIFTER 2 VBŘ





The double-row potato lifter 2 VBŘ is applied when lifting potatoes from two windrows, planted by machine and having a windrow space of 70 cm. It is possible to lift potatoes planted in furrows if the distance does not exceed 65—75 cm. The lifter is designed to be attached to the ZETOR 25 tractor or some other similar tractor.

The lifter consists of the base, the travel wheels, the hitch, the share, the elevator and the lifting and gearing devices. When in motion the two shares subsoil the windrows and the soil, together with bulbs and topgrowth, pass from the share to the first main elevator where, by a violent swing of the latter, the soil is sifted through the orifices, while bulbs and topgrowth and soil remnants fall on to the second stage-elevator. During this operation part of the clods are crushed and during continued motion of the elevator are sifted through its orifices. Bulbs, topgrowth and remaining soil fall off the stage-elevator down to the ground.

The lifter base serves for chucking all components. On the right side of the machine is mounted the operator's seat. The lifter has two shares of hardened steel, of 6 mm thickness. It has two elevators. The lifting device serves for governing the width of lifting of the two shares and for their lifting and dropping. The elevators are driven by the tractor power-take-off shaft. Lubrication by pressure lubricators.

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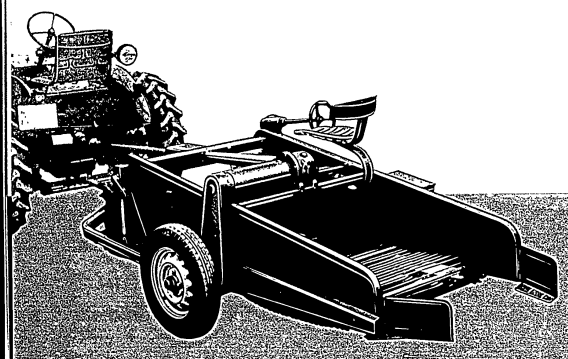
2 VBŘ

TECHNICAL DATA

Length	3930 mm
Width	1720 mm
Height	1130 mm
Weight	650 kg
Wheel gauge	1530 mm
Lifting width	1400 mm
Capacity	0,45 Ha/h

Owing to a constant development in construction all the above mentioned data and illustrations are not to be considered as binding



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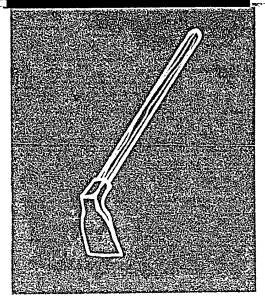
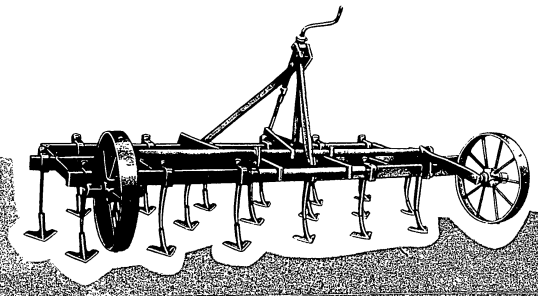
SČ.01-31337-57-n

THE KHN 280 MOUNTED CULTIVATOR





The KHN 280 mounted cultivator is an implement used for sub-surface tillage and designed to be operated with the ZETOR SUPER wheel tractor which is equipped with a hydraulic power lift. In designing this cultivator attention was paid to the fact that the machine might be used for all kinds of fallow cultivation. The cultivator is, therefore, provided with several sets of working tools which are easily interchangeable according to the job to be done.

The cultivator consists of a cross-braced frame made of welded channel sections, 19 clamps with working tools are attached to the frame in three rows; these working tools are laterally (i.e. along the frame) as well as vertically adjustable. The working depth of the implement is controlled by means of two adjusting wheels which are attached to the beam. These wheels are adjusted by means of a screw and a crank which are accessible from the seat of the tractor driver.

The standard accessories of the KHN 280 cultivator include the following working tools:

19 arrow-shaped full sweeps (A-shares) for cultivation up to 12 cm.

19 chiselling shares for a max. working depth of 20 cm.

19 double-pointed reversible shovels for sub-surface tillage up to a max. working depth of 8 cm.

19 heart-shaped full sweeps (A-shares) for sub-surface tillage up to a working depth of 8 cm.

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KHN 280

SPECIFICATIONS

Overall length	1790 mm
Overall width	2800 mm
Overall height	1550 mm
Working width	2800 mm
Weight with complete set of working tools	529 kg
Standard spacing of individual working tools	150 mm
Maximum working depth	20 cm

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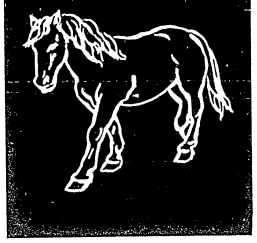
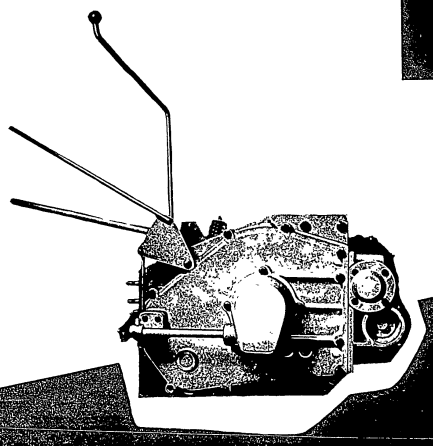
THE Š 30 SINGLE-DRUM POWER WINCH





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Š 30

SPECIFICATIONS

Overall length including guide rollers	680 mm
Overall width	700 mm
Drum diameter	250 mm
Length of drum	272 mm
Total weight including oil filling	286 kg
Ground clearance	325 mm
Cable diameter	11,2 mm
Length of cable	82 m
Pull at rated speed	2800 kg

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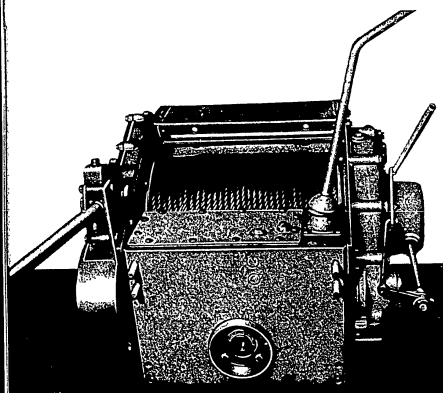

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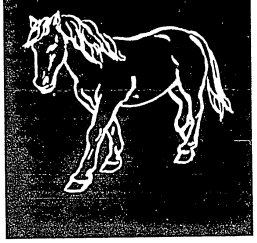
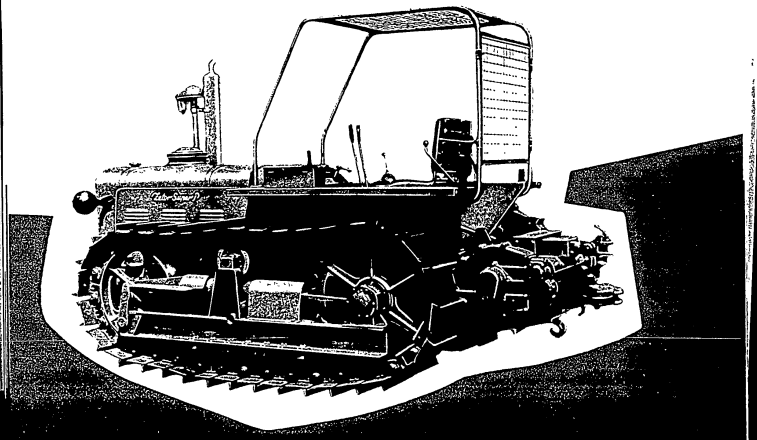
THE Z 65 SINGLE-DRUM POWER WINCH





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Z 65

SPECIFICATION

Overall length	705 mm
Overall length including guide rollers	900 mm
Overall length including hitch	930 mm
Overall width	845 mm
Diameter and length of drum	198 and 472 mm
Total weight including oil filling	520 kg
Ground clearance	300 mm
Length of cable	100 m
Cable diameter	14 mm

Speed of drum at rated engine speed

Ist speed	53 r. p. m.
2nd speed	92 r. p. m.
Reverse speed	77 r. p. m

Pull at rated engine speed

Ist speed and first cable layer	4150 kg
Ist speed and third cable layer	3370 kg
Ist speed and fifth cable layer	2780 kg
2nd speed and first cable layer	2300 kg
2nd speed and third cable layer	1950 kg
2nd speed and fifth cable layer	1600 kg
Reverse speed and first cable layer	2740 kg
Reverse speed and third cable layer	2320 kg
Reverse speed and fifth cable layer	1900 kg

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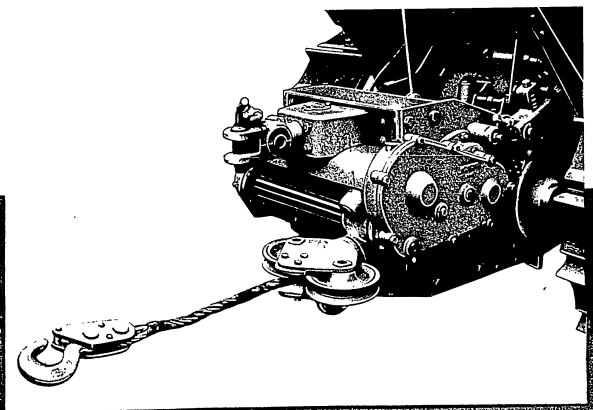

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3 DHK

Inter-row cultivator
Two hoeing sets, each consisting of 3 rigid shanks with sweeps, are attached to the square bar by means of clamps and bolts in order to destroy the weeds The working position of these rigid shanks carrying the hoeing sweeps must be adjusted according to the shape of the hills or ridges. Standard equipment. 2 sliding shoes, 1 double-end spanner 17X19, 3 dibbling shovels.

SPECIFICATIONS

Weight of complete VŠEROB cultivator (including all attachments and working tools)	138 kg
Dibbling attachment:	
overall length	1000 mm
overall width	1900 mm
overall height	550 mm
weight	87 kg
maximum working depth	150 mm
Furrow covering and hilling or ridging attachment:	
overall length	500 mm
overall width	1900 mm
overall height	500 mm
weight	31 kg
maximum working depth	150 mm
Inter-row cultivator:	
overall length	550 mm
overall width	1900 mm
overall height	500 mm
weight	43 kg
maximum working depth	50 mm

As we are constantly improving and developing the construction and design of all our machines and implements, the specifications and illustrations should not be regarded as binding.

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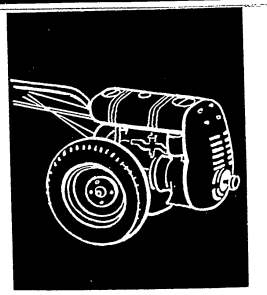
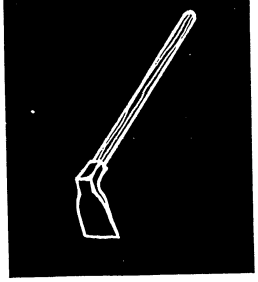
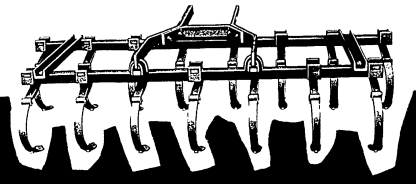
THE VŠEROB 3 DHK MULTI PURPOSE CULTIVATOR



THE UK 153 CULTIVATOR ATTACHMENT





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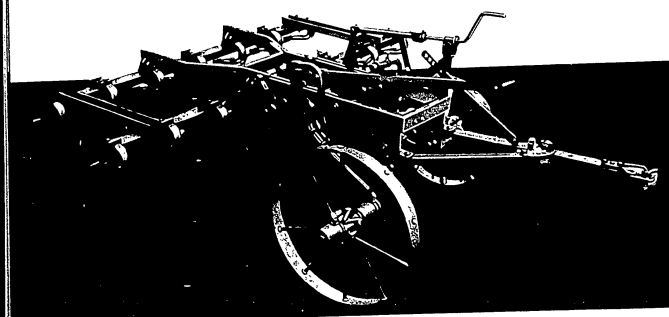
UK-153

SPECIFICATIONS

	Without forecarriage	With
Overall length	1300 mm	2590 mm
Overall width	2180 mm	2180 mm
Overall height	550 mm	1280 mm
Ground clearance below frame	390 mm	
Total working width	210 cm	
Maximum working depth	12 cm	
Weight	174 kg	364 kg
Draft required on hook at specific soil resistance of 60 kg/dm² (maximum working depth)	540 kg	
Approx. performance at 5 km/hr speed	0,7 ha/hr	

As we are constantly improving and developing the construction and design of all our machines and implements, no specifications or illustrations should be regarded as binding



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F-651

SPECIFICATIONS

Overall length	1120 mm
Overall width	760 mm
Overall height	660 mm
Weight	109 kg
Working width in average soil conditions	600 mm
Working width when working in hard soils	400 mm
Wheel tread of ploughing wheels of the MOTOROBOT garden tractor	655 mm
Maximum cutting depth	250 mm
Working speed	2,1 – 2,7 km/hr

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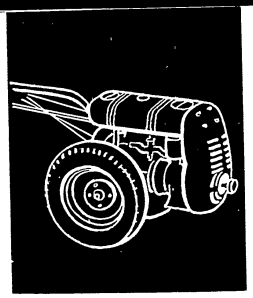
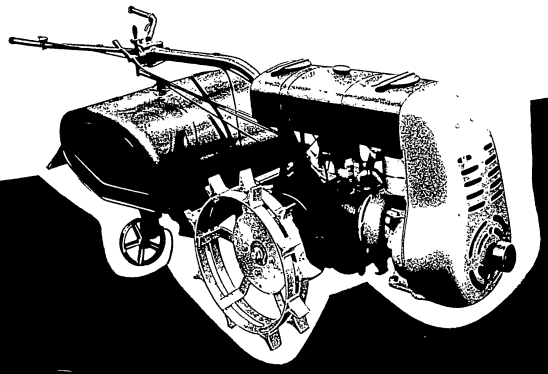
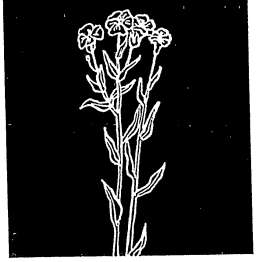
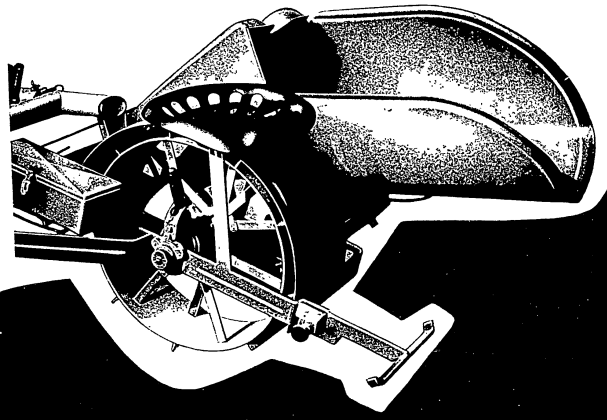
THE F-651 ROTARY CULTIVATOR





THE KTL 1 HORSE-DRAWN FLAX PULLING MACHINE





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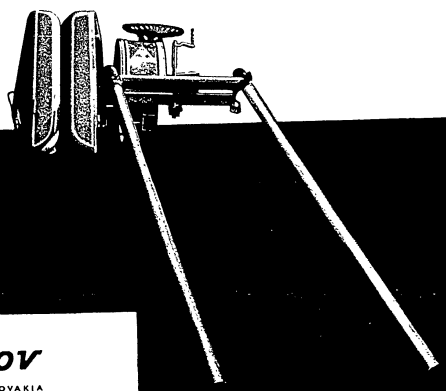
KTL-1

SPECIFICATIONS

Overall length including thills	3,430 mm
Overall length without thills	2,200 mm
Overall width	1,460 mm
Overall height	910 mm
Ground clearance	150 mm
Weight	270 kg
Number of pulling units	1
Working width	400 mm
Working speed	3—5 km/hr
Mean output	0.8 ha/8 hr
Left-hand (driving) wheel dimensions	dia. 620 mm, width 200 mm
Right-hand wheel dimensions	BANTAM 16—4

As we are constantly improving and developing the construction and design of all our machines and implements, the specifications and illustrations should not be regarded as binding.



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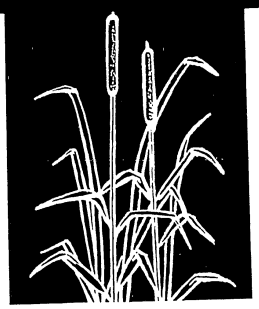
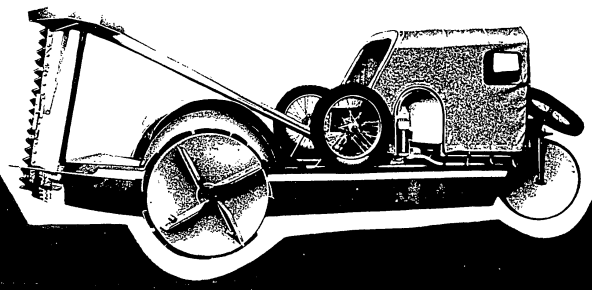
THE ESOX AMPHIBIOUS WATER WEED LAUNCH





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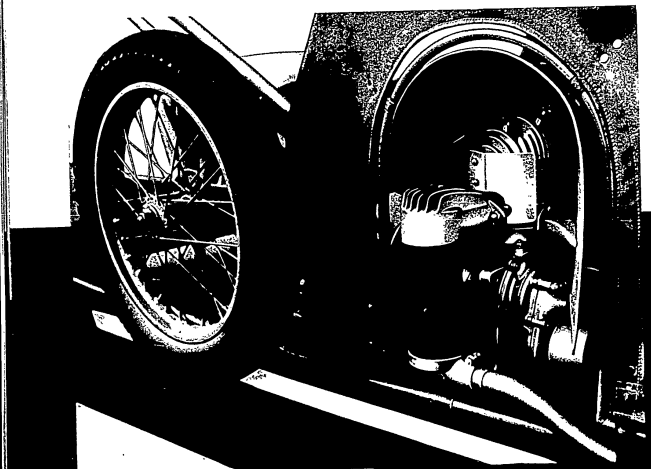
ESOX

SPECIFICATION

Overall length of machine	5500 mm
Overall width of machine	2200 mm
Overall height of machine	1900 mm
Weight of machine	500 kg
Output of engine	5.3 H P
1st speed, forward and reverse	4 km. per hr
2nd speed, forward and reverse	8 km per hr
Working width	210 cm
Maximum cutting depth	110 cm
Maximum output in water	0 5 hectare per hr
Maximum output in mud	0.35 hectare per hr

Since the machines are being steadily improved the specification and illustrations should not be regarded as binding



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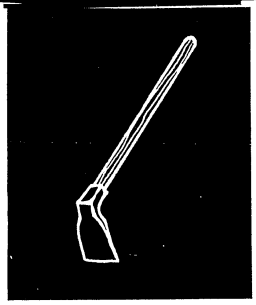
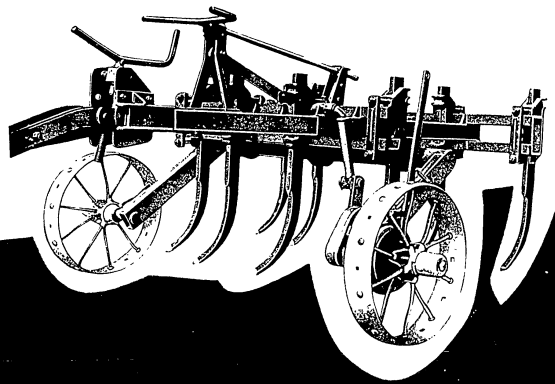
THE KHZ 200 RIGID-TINE CULTIVATOR FOR DEEP TILLAGE





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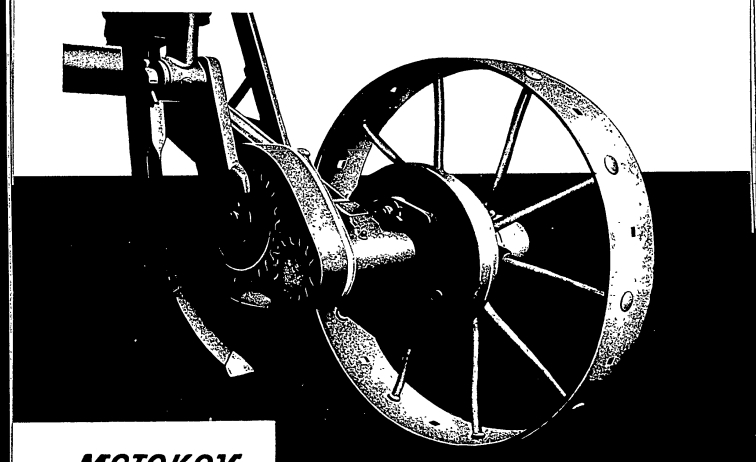
KHZ 200

SPECIFICATIONS

Maximum width	2150 mm
Maximum length	2500 mm
Maximum height in transport position	1320 mm
Number of tines	9
Working width when using subsoliers	1840 mm
Working width when using chisels	1640 mm
Working width when using double-pointed reversible aerating shovels	1660 mm
Working width when using aerating shovels with cast points	1730 mm
Cutting depth	max. 300 mm
Weight including working tools	750 kg
Working speed	5 km/hr.

As we are constantly improving and developing the construction and design of all our machines and implements, the specifications and illustrations should not be regarded as binding.



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KL-3

mechanization. Its construction, high-class material and capacity give best guarantee that the harvester KL-3 will become a most helpful assistant of every flax-grower.

TECHNICAL DATA

Total length	4160 mm
Width	3450 mm
Height	2300 mm
Total weight	2180 kg
Trailer capacity	2 m^3
Approximate capacity	0,4 ha/h

Owing to a constant development in construction all the abovementioned data and illustrations are not to be considered as binding

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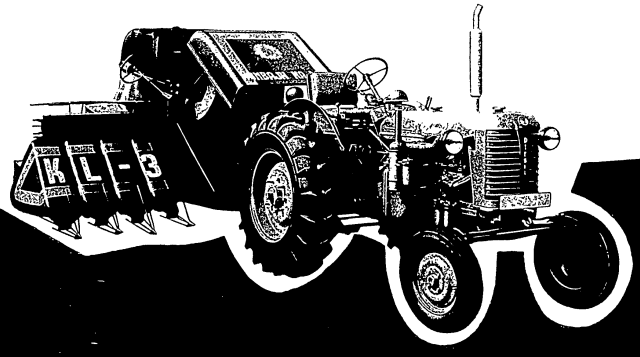
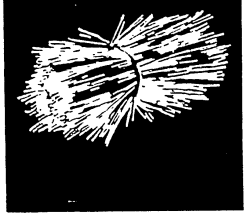
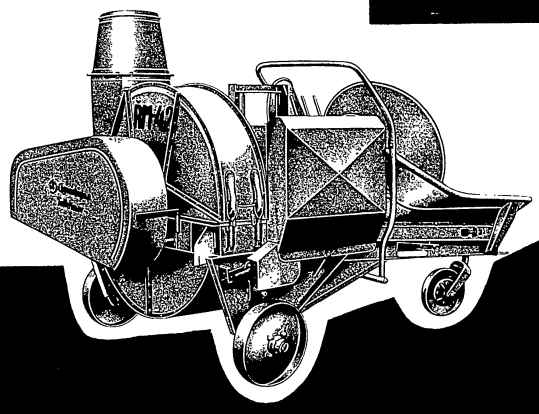
THE KL-3
FLAX HARVESTER



THE ŘM 42
ENSILAGE CUTTER





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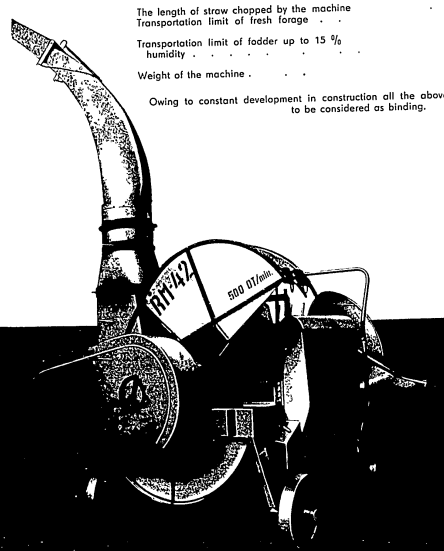
ŘM-42

TECHNICAL DATA

Length of the machine	2700 mm
Width of the machine	2000 mm
Height of the machine	1680 mm
Drum diameter	1260 ± 5 mm
Drum width	300 — 3 mm
Blade wheel diameter	1230 ± 3 mm
R. p. m.	500
Orifice section	420 mm
Electromotor input	12 kW
Amount of chopped forage per hour, the length of the chopped straw being 20 mm	4000 kg/fodder 12000 kg/fresh forage
The length of straw chopped by the machine	20, 40, 80, 160 mm
Transportation limit of fresh forage	8 m distance 15 m height
Transportation limit of fodder up to 15 % humidity	45 m distance 15 m height
Weight of the machine	1000 kg

Owing to constant development in construction all the above-mentioned data are not to be considered as binding.



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PK-X

is provided with supporting props which can be pushed out, thus ensuring the stability of the whole set when working.
The steam-boiling unit proper can also be used for steam-heating or warming liquid forage. It is also possible to treat maize-ears by steam-boiling instead of potatoes.
The accessories of the steam-boiling set, i. e. the mobile washing machine, the mashing machine and the conveyor, form separate units with their own electric drive and can be used independently of the steam-boiling unit proper. The sphere of use of each of the above mentioned machines is thus substantially extended.
Besides the mobile steam-boiling set, there is also manufactured an immovable type of this steam-boiling set with a stationary fire-box.

SPECIFICATIONS

Transport speed behind motor car	8 km/hr
Capacity of boiler	260 l
Water filling	200 l
Heating surface of boiler	8.50 m²
Direct heating surface of boiler	5.50 m²
Area of grate	0.35 m²
Capacity of steam container	830 l
Quantity of potatoes in 1 steam container	600— 650 kg
Output of steam container	600— 650 kg/35—40 min
Output of steam-boiling set (including its filling and tilting)	1500—1700 kg/hr

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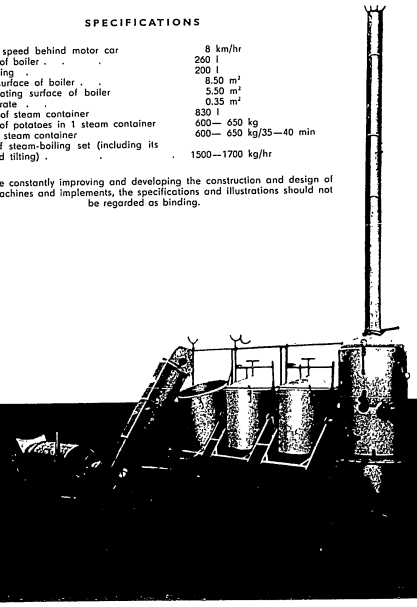

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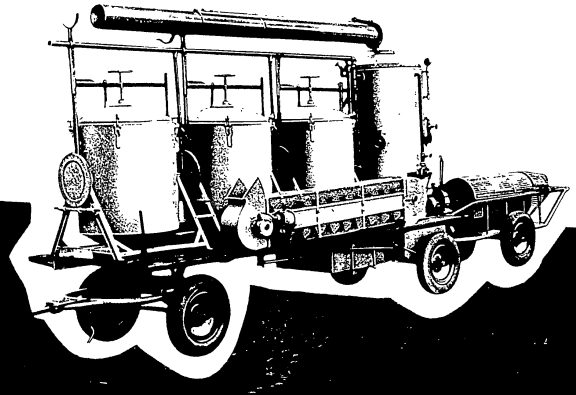
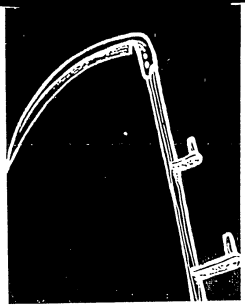
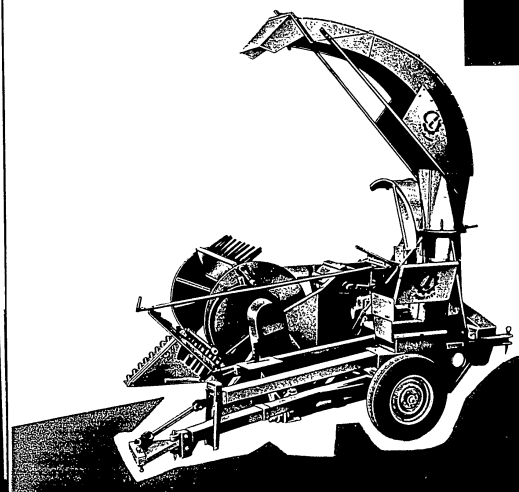
THE PK-X MOBILE STEAM-BOILING SET



THE SŘZ-42 FORAGE HARVESTER





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SŘZ-42

The SŘZ-42 forage harvester is a heavy-duty machine manufactured of quality material. All supporting parts are made of rolled sections and sheet truss girders. The housings of the transmission gears are manufactured of grey cast iron and the gears of quality hardened steel. The crown of the helical gear is made of aluminium bronze.

SPECIFICATIONS

Overall length	3500 mms	Weight	1300 kgs
Overall width	2200 mms	Number of knives	4
Overall height without deflector	1650 mms	Number of knife wheel revolutions	600 Rev/min
Overall height with deflector	3500 mms	Required power input	approx. 20 HP
Knife wheel housing diameter	1260 mms	Theoretical length of cut	20, 40, 80
Knife wheel diameter	1230 mms		160 mms
Width of intake throat	420 mms	Type of cutter bar	standard
Wheel track	1800 mms	Maximum performance	21.000 kg/hr—
Working width of cutter bar	1292 mms		0.85 ha/hr

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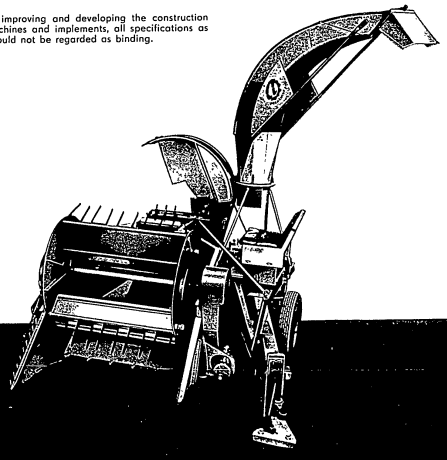

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RMT 3

SPECIFICATION

wheel track	1450 mm
wheel base	2100 mm
box capacity (when fully loaded)	max 3.5 cu. m
weight of load	max. 3000 kg
number of antifriction bearings	21
maximum speed	10 km/h
brake	automatic overrun type braking the rear wheels
overall height	2100 mm
overall width	1850 mm
overall length	5650 mm
overall weight	1520 kg

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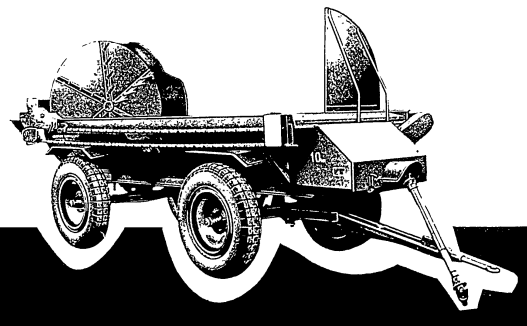

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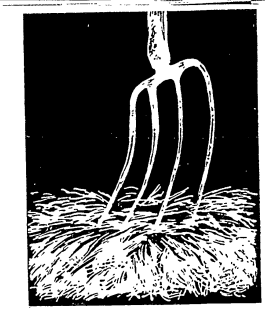
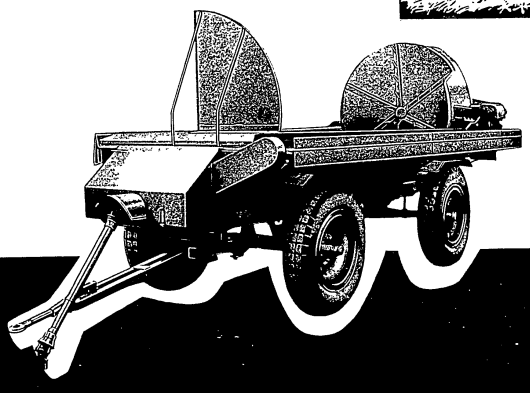
THE RMT 3
MANURE SPREADER





NOVITAS

SPECIFICATION

Working width	2 m	2·5 m	3 m
wheel track	235 cm	285 cm	335 cm
hopper capacity	100 kg	120 kg	150 kg
approximate net weight	205 kg	250 kg	270 kg
diameter of wheels	60 mm	60 mm	60 mm
working speed	5—6 km/hr	5—6 km/hr	5—6 km/hr
output at 6 km/hr speed	1·2 ha	1·5 ha	1·8 ha

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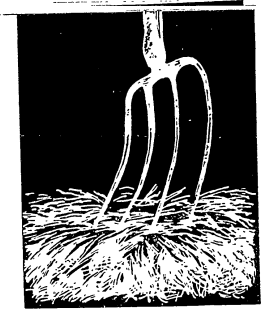
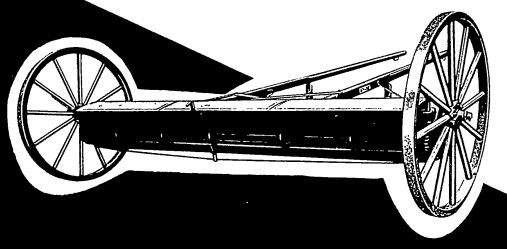
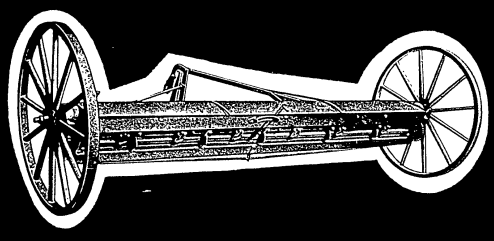
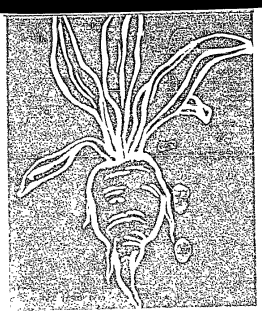
THE "NOVITAS" FERTILIZER DISTRIBUTOR

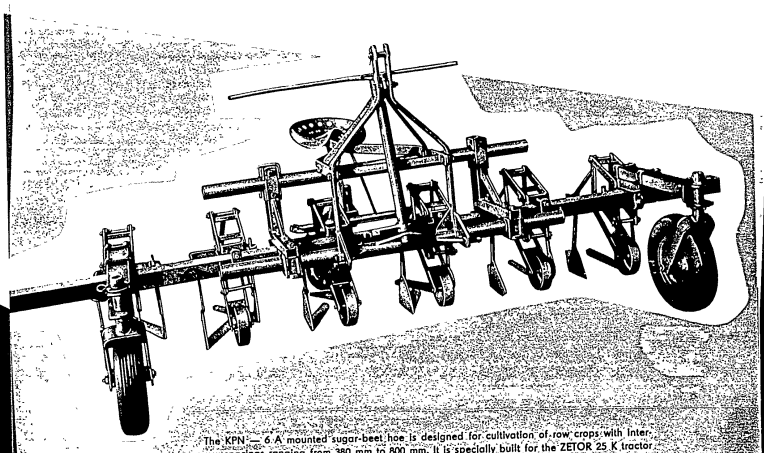






THE KPN 6A MOUNTED SUGAR-BEET HOE





The KPN — 6 A mounted sugar-beet hoe is designed for cultivation of row crops with inter-row spacings ranging from 380 mm to 800 mm. It is specially built for the ZETOR 25 K tractor with hydraulic power-lift.

The hoe consists of a main frame, operator's seat board, steering and seven parallel-link double arm suspensions to which the hoing teeth are attached. The frame is hitched to the tractor and provided with a quadrant and rack steering. The quadrant is secured against getting out of mesh with the rack by end stops on both ends. The steering is controlled by a hand lever from the operator's seat, the steering range being of 17 cm on either side of the centre line. Two of the parallel-link double arm suspensions have supporting wheels with BANTAM pneumatic tyres serving as adjusting wheels of the frame. The third (auxiliary) wheel with 250 mm in diameter is located below the seat and put into operation only when the hoe is not hitched to a tractor. The frames for the hoeing teeth are carried by parallel-link double arm suspensions, the transverse spacing of which may be changed to meet various working conditions. Generally the hoe is used as a six-row implement, i. e. it operates five full rows and twice a half row. In this case the two parallel-link double arm suspensions on the end portions of the frame are provided only with inside half-sweeps. For extra wide inter-row spacings the stays of the guiding rollers can be shifted lengthwise along the frame of the hoe. Each of the parallel-link double arm suspensions has its own supporting wheel (roller) running on the ground which has not yet been touched by the sweeps, thus reliably main-

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KPN 6A

taining the uniform cutting depth. The cutting width of each set of hoeing teeth may be adjusted by changing the width of the two-section frame on to which the side halfsweeps are clamped. The shank of the centre sweep or chisel is held by the front clamp connecting and retaining the two sections of the frame. After exchange of the packing piece a ridging body or hoeing teeth for cultivation of potatoes may be fixed in this clamp, too. The shanks of all working tools are provided with gauge marks in order to facilitate depth adjustment. Owing to up-the-row-thinning the hoe is equipped with adjustable markers being mounted on both ends of the hoe frame. These markers enable up-the-row-thinning with locked steering of the hoe, without any action of the operator, while the tractor driver follows the trace left by the marker. The main preference of the KNP — 6 A sugar-beet hoe consists in its ability of cultivating various row-crops, i. e. sugar-beet as well as potatoes. The interchangeability, of the working tools guarantees a perfect exploitation of the hoe for all kinds of row-crop cultivation. The hoe may be easily steered in rows and enables a quick transport to the field.

SPECIFICATIONS

overall length	2,050 mm
overall width	3,200 mm
overall height	1,220 mm
weight (with complete hoeing teeth, accessories and markers)	571 kg

As we are contantly developing and improving the construction and design of this implement, all technical data and specifications as well as illustrations should not be regarded as binding.

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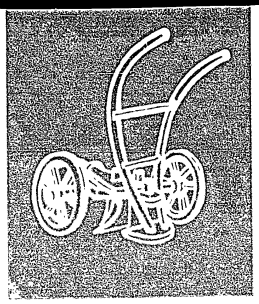
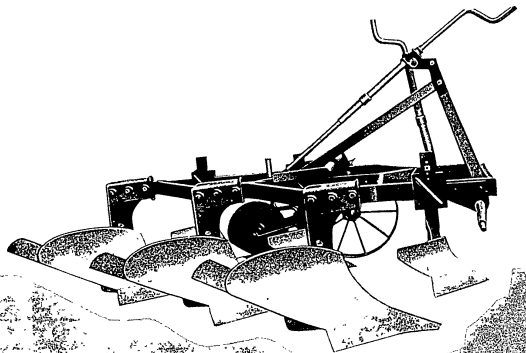
Sčs 01-30261-57

THE 3 PN 35 THREE-FURROW MOUNTED PLOUGH





This type of mounted plough is well suited for deep ploughing in soils designed for cereal crops and technical crops such as flax, hemp, etc. It may be conveniently used for those soils where the specific soil resistance does not exceed 0.7 kg/cm².

The sturdy frame of the plough, made of high quality material, is provided with 3 bottoms of the U-35 Z type. Longitudinal spacing between the main bodies amounting to 65 cm eliminates clogging in muddy conditions. The plough is provided with 3 skim coulters and 1 disc coulter in front of the rearmost body. On the land side (left-hand side) there is a land wheel for adjustment of the cutting depth. A scraper mounted to this wheel removes any earth which may have adhered to it. The cutting depth as well as the working width are controlled quite easily by means of 2 adjusting screws with cranks which are accessible from the tractor driver's seat. The rear part of the frame with the mounted on body can be removed so that the plough may easily be converted into a two-furrow unit after displacement of the land wheel with its shaft and re-adjustment of the screw type control. The plough is designed for operation behind the ZETOR SUPER Diesel tractor with hydraulic power lift.

High-grade material, its well proven design and easy attendance ensure the 3 PN 35 mounted plough permanent popularity with farmers.

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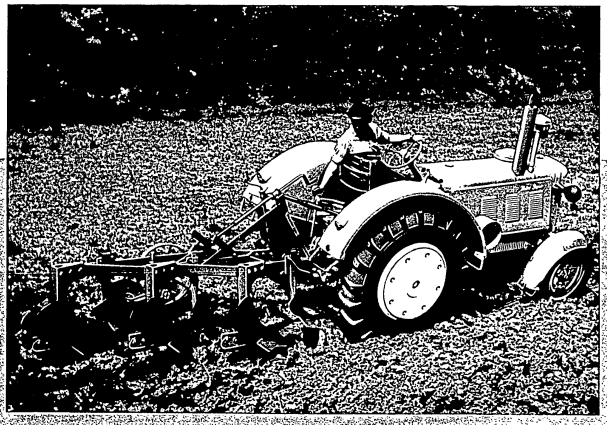
3 - PN - 35

TECHNICAL DATA

Length	2,500 mms
Width	1,640 mms
Height	1,500 mms
Weight	460 kgs
Cutting width of one bottom	35 cms
Cutting width of the plough	105 cms
Maximum ploughing depth	28 cms

Due to the fact that we are steadily improving the design and construction of our machines, the illustrations and specifications are not binding.



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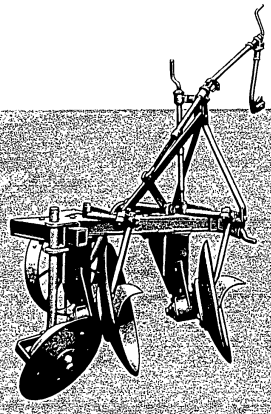
2 - PDN - 35 - 1

SPECIFICATIONS

Overall length	mm	1,630
overall width	mm	1,100
overall height	mm	1,525
number of discs	pcs	2
diameter of discs	cm	65
maximum cutting depth	cm	22
minimum cutting depth	cm	12
maximum cutting width	cm	70
weight of plough	kg	367

As we are constantly developing and improving the construction and design of this implement, all technical data and specifications as well as illustrations should not be regarded as binding.



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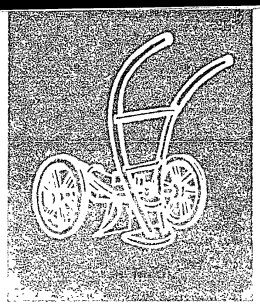
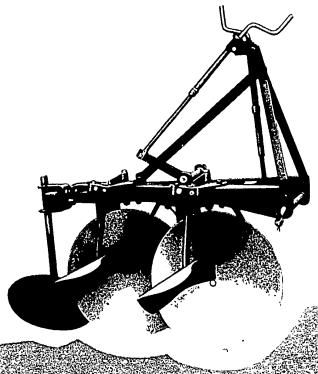
THE 2-PDN-35-1 MOUNTED DISC PLOUGH





The 2-PDN—35—1 mounted disc plough is designed in the first place for ploughing of uncultivated virgin-soils. It has proved its value particularly in those soils where roots, stones and similar soil obstacles occur.

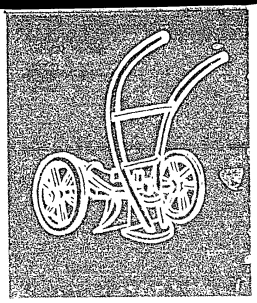
The cutting depth is adjustable from 12 to 22 cm. The cutting width varies according to the adjustment of the cutting angle and to various cutting depths. When the maximum angle of discs is set and at a maximum cutting depth of 22 cm, the working width of the plough amounts to 70 cm.

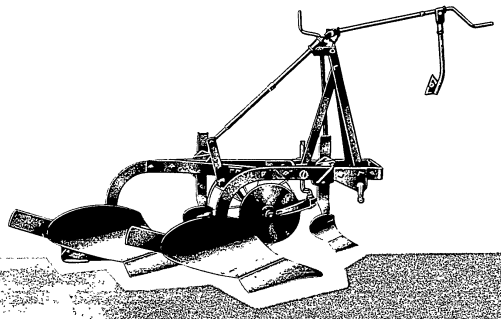
On its land (left) side the disc plough is provided with a wheel for adjustment of the cutting depth.

Both this depth adjusting wheel and the discs have scrapers removing the adhered earth. There are two types of scrapers: bigger scrapers for medium and light soils, which are bent in the form of a mouldboard and smaller scrapers for heavy and sticky soils. The cutting depth and cutting width are adjusted by means of two adjusting screws which are easily reached from tractor's seat. The rear coulter is mounted on to the rear portion of the cross frame; it is adjustable in the clamp as regards the cutting depth, the cutting width and the angle of its working position.

The main advantage of this plough consists in the fact that the disc plough in contradistinction to the mouldboard plough cuts through every soil obstacle or runs over it without deforming the implement or damaging the tractor. Likewise the load of the tractor is substancially lower than when using a standard mouldboard-bottom plough. The 2-PDN—35—1 mounted disc plough is designed for use with the ZETOR 25 K tractor.

THE PN 252 MOUNTED PLOUGH





This plough is particularly well suited for ploughing smaller plots not accessible to other types of ploughs. Lightnes of control, outstanding manoeuvrability on headlands and quick transport to the field are the main features of this plough.

The frame of the plough is made of flat steel. It is heavily braced with cross members and reinforced to resist any deformation. The plough is provided with two shares with a total working width of 50 cm the maximum cutting depth being 25 cm. Longitudinal spacing of the shares measured between the share points is 63 cm. A vertically adjustable disc coulter leaves a clean and straight furrow behind the plough. The general purpose type of the mouldboards ensures an outstanding performance under all average soil conditions. The shares are provided with extension wings for better turning of furrow slices and improving of coverage. The plough may be equipped also with two vertically adjustable skim coulters. On its left side the plough is provided with a land wheel following exactly the contour of the ground surface and eliminating automatically any deviations from the uniform cutting depth. This land wheel being equipped with a scraper is designed for adjusting the cutting depth of the plough. The cutting depth as well as the cutting width are controlled by two long adjusting screws easily accessible from the tractor driver's seat.

The PN 252 mounted plough is designed for use behind the 25 K ZETOR Diesel tractor, provided with a mechanical distance control mounted on the tractor seat. The plough is attached to the hydraulic power lift of the tractor by the three—point suspension. Sturdy construction and high quality material guarantee a long service life of this plough.

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PN 252

SPECIFICATIONS

Overall length	2,050 mm
overall width	1,150 mm
overall height	1,485 mm
weight without the distance control	260 kg
number of shares	2
cutting width of 1 bottom	30 cm
working width of the plough	60 cm
maximum cutting depth	25 cm
performance at 5 km/hr speed	0.25—0.30 ha/hr

Standard equipment: 2 spare shares, 2 spare shares for skim coulters, 2 spanners, 1 grease gun.

As we are constantly developing and improving the construction and design of all machines and implements, all technical data and specifications as well as illustrations should not be regarded as binding.

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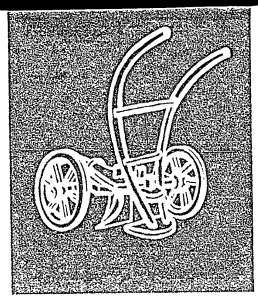
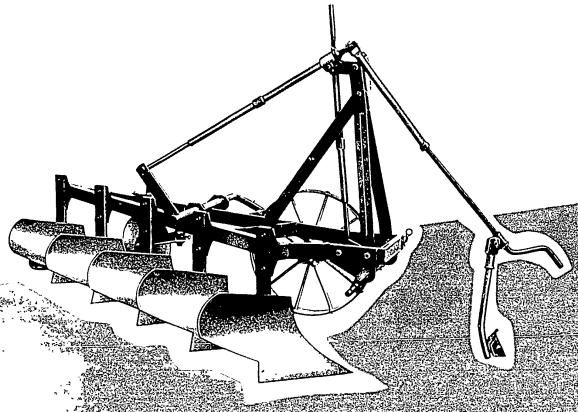
THE PN 532 FIVE FURROW MOUNTED PLOUGH





The PN 532 five—furrow mounted plough may be very conveniently used in those regions where deeper ploughing is not necessary. It is designed for shallow ploughing up to maximum cutting depth of 10—12 cm and for medium—deep ploughing. The plough is attached to the hydraulic power lift of the 25 K or 25 A type of ZETOR Diesel tractor by the three-point suspension. The shape of the shares as well as their reasonable longitudinal spacing eliminate clogging of the plough and secure a good turning of the furrow slices and covering of the stubble. The frame of the plough is made of high grade flat steel. Its main part is a diagonal beam with welded bed plates for holding of five bottom adaptors. The bed plates of the adaptors have extending side ribs and thus form a channel securing the correct position of the adaptors. The cutting width of each share is 25 cm the total working width of the plough being therefore 125 cm. A vertically adjustable disc coulter is mounted in front of the rear share. On its left side the plough is provided with a land wheel equipped with a scraper for adjusting of the cutting depth of the plough. The land wheel is controlled by a screw-type mechanical distance control attached to the tractor driver's seat. The working width of the plough is controlled by turning a crank shaft. This crankshaft is turned by means of an adjusting screw having the crank accessible from the tractor seat. Both of these adjusting screws are dust-proof.

In constructing this plough, as mentioned above, the use of quality material has been used. The mouldboards are manufactured of three-layer armour steel with soft centre-layer the outside layers being hardened. The hardness of the mouldboards amounts to minimum 500 according to Brinell hardness test and their working surface is ground and polished. The shares are made of steel and their cutting edges are heat—treated and hardened up to 6000 according to Brinell hardness test.

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PN 532

The main features of the PN 532 five—furrow mounted plough, besides its long service life, are as follows:

1. quick transport,
2. easy manoeuvrability and short turning radius on headlands enabling even the ploughing of smaller plots,
3. saving of material and time.

Standard equipment: 5 spare shares, 2 spanners, 1 grease gun.

SPECIFICATIONS

approximate overall length	2,200 mm
approximate overall width	1,450 mm
approximate overall height	1,370 mm
longitudinal spacing of bodies in direction of tractor's movement (measured between the share points of two adjoining bodies)	370 mm
cutting width of 1 share	25 cm
maximum cutting depth	10—12 cm
approximate weight of plough with accessories	230 kg
approximate performance at 5 km/hr speed	0,35 ha/hr

As we are constantly improving and developing the construction and design of this plough, all technical data and specifications as well as illustrations should not be regarded as binding.

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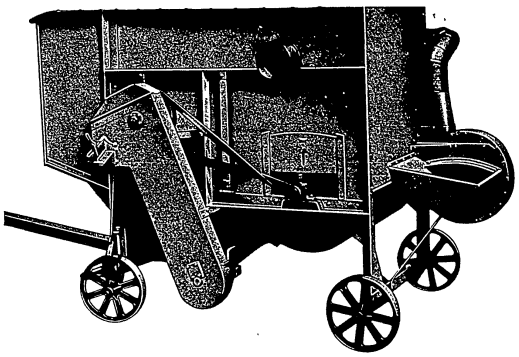
TYPE 1-900
» NEW RECORD «
CLOVER HULLER



This implement is intended for the hulling of clover seeds. The clover is first put through the ordinary threshing machine to knock off the seed heads which the Clover Huller will hull and clean in one operation.

The Clover Huller is of all-metal structure, the frame being provided with cast iron wheels. The front wheels are steerable by means of the x-type hitch pole at the end of which a suspension lug is fitted for hitching behind the tractor.

The hulling cylinder is provided with short teeth, and the cross beams are stiffened with hardened steel rings. The crushing cage is built up of steel meshing. The large diameter, low speed fan is provided with an adjuster flap in addition to the adjustable feeding channel. Transverse feed is used for seed cleaning. Both the upper (gathering) and the lower (chaff collecting) sieves are in constant use, while the intermediary (cleaning) sieve is replaceable to suit the size and the sort of seed to be cleaned.

In order to facilitate the loading, the aspirator is placed really low. The lift is provided with a leather belting with pockets and one baler.

All component parts are of high-grade, fully machined materials, ball bearings being used throughout.

The "New Record" is an implement the high rate of output and the structural design makes it eminently suited even for the most exacting jobs.

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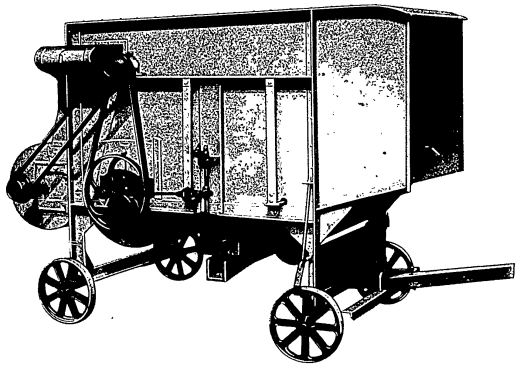
TECHNICAL DATA

Length	2800 mm
Width	1650 mm
Height	1700 mm
Weight	495 kg
R. p. m.	1250
Power drive	by flat belt, power input required being 3.3 kW
Capacity	800 kg of cleaned seeds every 10 hours

All the technical specifications and illustrations are given without any obligation on our part.



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SPECIFICATIONS

Overall length	3,780 mm
Overall width	3,310 mm
Overall height	1,550 mm
Overall width of the seed drill with markers in transport position	3,600 mm
Overall width of the seed drill with markers in transport position	3,800 mm
Wheel track	3,000 mm
Working width	2,625 mm
Number of rows	35 pcs
Inter-row spacing	75 mm
Hopper capacity	150 dm³
Weight	730 kg
Maximum working speed	4—5 km/hr
Output per hour at 5 km/hr	1.30 ha

Seeding chart of the 35 — SVBZ — 75 seed drill, diameter of wheels = 130 cm.

| Sort of seed | Number of rows | Inter-row spacing | Control B | Control of the seeding rate on the large dial — A scale. Discharged amount of seed in kg per 1 ha. | | |

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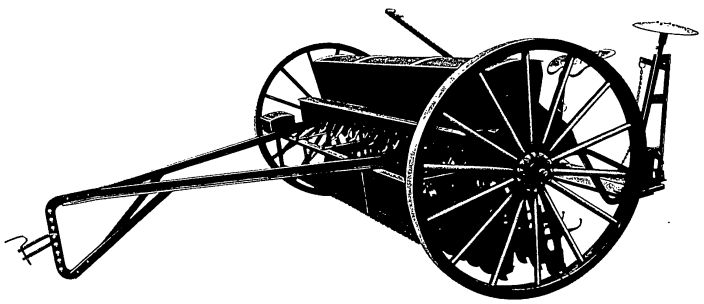
THE 35-SVBZ-75 SEED DRILL



The 35-SVBZ-75 seed drill is a tractor drawn general purpose corn seed drill with an external force-feed mechanism of fluted roller type, designed for both overshot and undershot discharge of grain, thus allowing the seeds to be sown in narrow rows. It can however, be used very conveniently when other kinds of crops are sown, similar to cereal crops as far as the size of seeds and the seeding rates are concerned. The overshot discharge of grain permits sowing of large seeds with easily damaged husks. The seed drill can be equipped in a very simple way with a clover seeding attachment for the purpose of seeding clover by broadcasting.

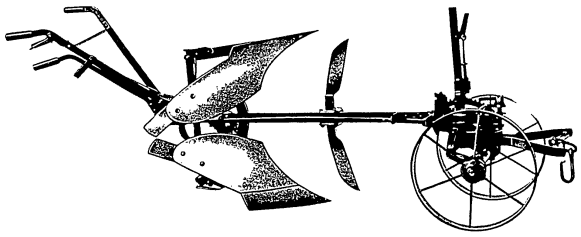
The seed drill is operated by one person. A foot board and a seat facilitate the operator's movements. Two disc markers trace the direction of motion of the tractor. The seed drill can be used either separately or in connection with other machines.

The 35-SVBZ-75 seed drill meets perfectly the requirement of sowing in narrow rows and enables discharging of grain up to a row width of 600 mm. For this reason this machine is very convenient for sowing sugarbeet, maize, etc. The seed drill may be connected with all types of tractors having a drawbar. The possibility of booth overshot and undershot discharge of grain as well as of equipping the seed drill with a clover seeding attachment makes this machine a highly efficient and all-round helper of every farmer.

Standard accessories:

Scraper for coulters and seed tubes, additional weights for each shoe type of coulter, a tubular spanner, 1 spanner for control lever, 1 oil can, a spacing board enabling separation of the individual coulters, 2 protective shields for coulters of shoe type, general operating instructions.

ROTO-AGRONOM ROTATING YOKE PLOUGH



The importance of rotating ploughs is well-known. They are used to advantage especially for work in mountainous regions and on sloping ground. Even in level regions, during ploughing of butts, wedge grounds and non-ploughed remnans after tractor ploughing the advantage of a plough which has two independent ploughshares and which guarantees good results when ploughing with right and left ploughshares is outstanding.

The plough has a flat steel shaft with transverse bars supporting the ploughshares. The front end of the shaft is roundly machined and set into the ploughfront head so that it can turn. On each side the head is provided with a setting stop into which there falls a safety catch. The setting stops are adjusted according to the inclination of the ground so that the plough allways works on the same level as the slope. The working depth is controlled by a sink bar. The wheel-track can be adjusted. The ROTO AGRONOM plough can be turned round its axle to both sides by 360°. The wheels of the front part are provided with a hub protected against the penetration of dust.

The standard plough accessories consist of 1 pair of coulters, 1 pair of reserve edges and a wrench. On special order 1 pair of front ploughshares and 1 pair of manure spreaders can be delivered.

TECHNICAL DATA

	ROTO AGRONOM 120	ROTO AGRONOM 130	ROTO AGRONOM 140
Weight	106 kgs	124 kgs	136 kgs
Working width	22,5 cms	25 cms	27,5 cms
Ploughing depth	19 cms	21 cms	23 cms

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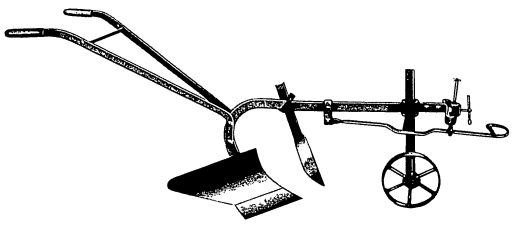
SP 6 LST SINGLE-FURROW YOKE PLOUGH

This plough has proved excellent in special cultures such as gardens, hop-gardens, vineyards and orchards. It is very easily handled and requires a relatively small yoke power. The plough has a bent shaft of flat steel. It is provided with mould-boards, a setting wheel and a knife coulter The ploughshare raker is of cultural form of three-layer armour. The construction of the plough is very simple but sufficiently rigid so that the plough can be well used even in hard soil The standard plough accessories consist of 1 reserve edge and 2 wrenches.

TECHNICAL DATA

Weight	40 kgs
Working width	23 cms
Ploughing depth	9—17 cms
Output per 10 hours	0,70 ha

In view of constant development no data or illustrations should be considered as binding.



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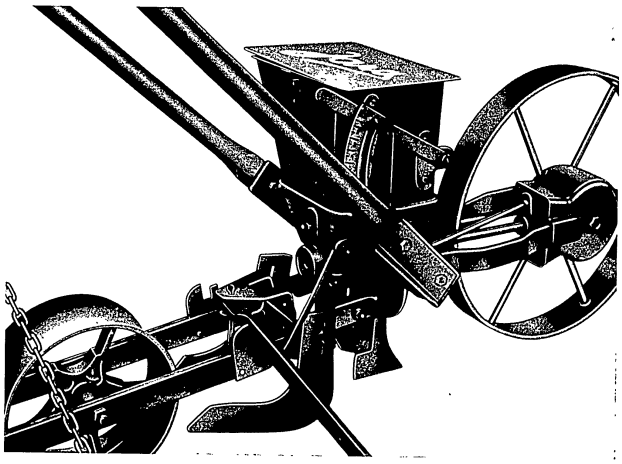
Sčs 01-30473-57-a

SPECIFICATIONS:

overall height	100 cm
overall length	150 cm
overall width	50 cm
weight	15 kg
hopper capacity	2 l

As we are constantly improving and developing the construction and design of all machines and implements, all specifications as well as illustrations should not be regarded as binding



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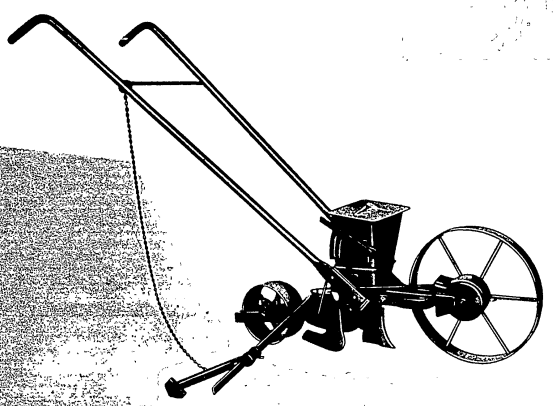
THE "JARO" SINGLE-ROW HAND SEEDER



This small hand seeder is designed for drilling all kinds of seed, particularly vegetable seeds; it is, therefore, especially welcomed by gardners and vegetable growers. The machine consists of a hopper, provided inside with an agitator forwarding light seeds during the seeding operation towards the seed pocket. The seeding mechanism consists of a shaft provided with wings and driven by means of reduction gear from the front wheel. The quantity of discharged seeds is controlled by a small lever combined with a scale this being provided with division marks from 1 to 7. A furrow opener being located below the seeding mechanism cuts the soil thus making a furrow for discharged sceds falling shrough the furrow opener. Two coverers mounted behind the furrow opener cover the seeds. These coverers are followed by a pressing roller for pressing the seeds into the soil. A marker which may be swung from one side of the hand seeder to the other marks out the trace for the next row thus enabling the operator to maintain straight rows. The operation of the "JARO" single — row hand seeder is quite simple. The hopper with a closed discharge hole is filled up with seeds (the control lever being adjusted on the zero — mark of the scale), whereupon the discharge hole has to be opened to the desired range by means of the control lever (according to the size of seeds). During operation both the front wheel and the rear pressing roller of the hand seeder rest on the ground; the seeder is disengaged simply by being raised.

TRT 8-5A

SPECIFICATIONS

total working width	4,800 mm
number of teeth	100
number of sections	5
overall weight	221 kg
performance at 5 km/hr speed	2.5 ha/hr

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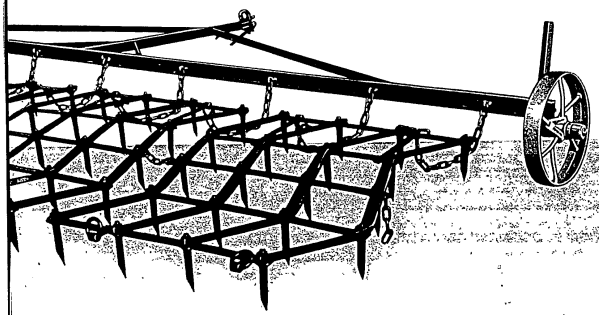

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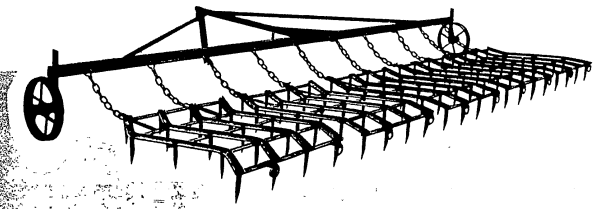
THE TDBTS 5A SPIKE TOOTH HARROWS



Although ploughing is the basic operation of farming, it has to be followed by further soil tillage. The TDBTS 5 A spike tooth harrows are designed for seed bed preparation, pulverization of soil, levelling the ground surface, destroying of weeds etc.

The harrows consist of 5 sections connected to the beam by chains. The beam is manufactured of section channel—steel and provided with two wheels. The teeth are of square section. Technically it is most important that each of the spikes may follow its own path different from the track left by the foregoing tooth; further, the spikes have to be effectively secured against turning the edge in incorrect direction during work.

All these requirements are perfectly met by the TDBTS 5 A harrows. The TDBTS 5 A spike tooth harrows are made of first-class material, all components may be easily replaced. The harrows have an outstanding performance being economical in operation.

B II-17-2500

SPECIFICATIONS

	B II—13—2000		B II—17—2500	
overall length with double wheel forecarriage	2850	mm	3100	mm
overall length with tractor hitch	—		2900	mm
overall width	2240	mm	2740	mm
wheel track	2000	mm	2500	mm
working width	2000	mm	2500	mm
overall height	1550		1550	mm
number of rows	13		17	
inter-row spacing	154	mm	147	mm
hopper capacity	100	dm^3	127	dm^3
weight (including double wheel forecarriage)	385	kg	435	kg
maximum working speed	4—5	km/hr	4—5	km/hr
output per hour at 5 km/hr	1	ha	1	ha

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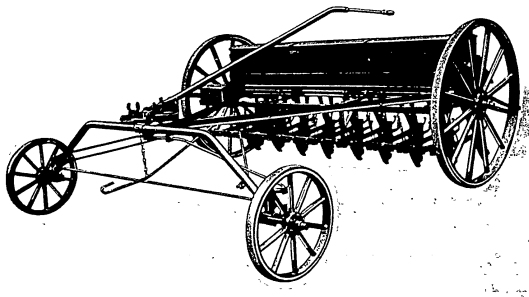

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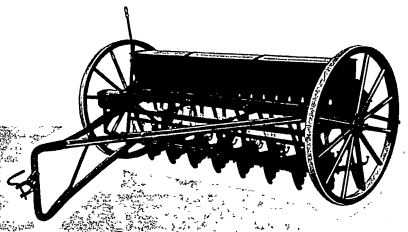
THE "FUTURE" B II-17-2500 SEED DRILL



Experiences of long standing have proved that the FUTURE seed drills are particularly suited for any climatic conditions and any kind of soil, as they do their job with an exceptional accuracy regardless of the grain handled. The "FUTURE" B II — 17 — 2500 seed drill is a machine with external force-feed mechanism of fluted roller type designed both for overshot and undershot discharge of grain. In order to effect a very exact steering of the seed drill this being provided with a double wheel forecarriage which may be easily removed and replaced by a tractor hitch. The emptying of the grain hopper is done quite simply by tilting it backwards. The „FUTURE" seed drill may be supplied either with furrow openers of standard European design or, at special request, with double disc furrow openers and chain coverers. It may be advantageous to make use of this seed drill when also other kinds of crops are sown, similar to cereal crops as far as the size of seeds and the seeding rates are concerned. The overshot discharge of grain permits drilling of large seeds with easily damaged husks. The seed drill may be equipped in a very simple way with clover seeding attachment for the purpose of sowing clover by broad-casting. The seed drill is provided with markers, telescoping seed tubes and spring pressure attachments. The construction of the seed drill is appropriately reinforced to make it proof against excessive stress. A foot-board and a seat may be supplied as extras. The „FUTURE" seed drill may be attached to any standard tractor without any previous adaptation. The seed drill measures out seeds in the desired quantity with the maximum of accuracy, regardless whether the smallest or largest seeds are involved, it maintains a uniform depth of seeding and covers well the furrows.

The FUTURE seed drill is really a general purpose machine, as it operates with absolute reliability not only on level plains, but also on hilly ground. All component parts of the seed drill are manufactured of the best material, thoroughly machined and carefully assembled. That is why the „FUTURE" seed drill works with minimum maintenance for long years without requiring any maintenance costs.

Two types of the „FUTURE" seed drills are being supplied according to number of rows and inter-row spacings.

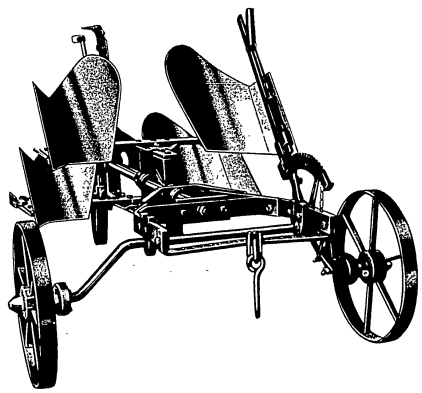
The wheel hubs are protected against the penetration of dust.

Standard accessories: 2 pair of reserve edges, 2 pairs of rakers, 1 wrench.

TECHNICAL DATA

Weight	135 kgs
Working width	48 cms
Ploughing depth	6—20 cms

In view of constant development no data or illustrations should be considered as binding.



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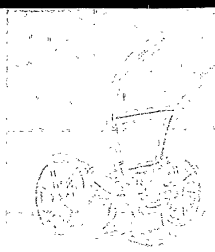
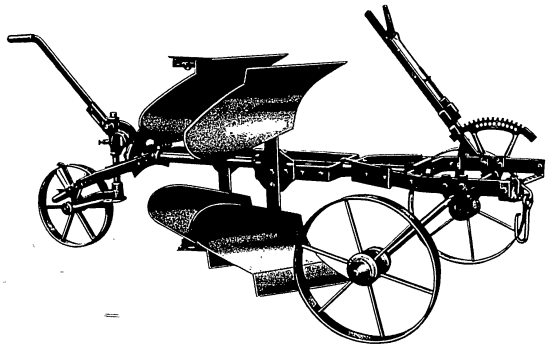
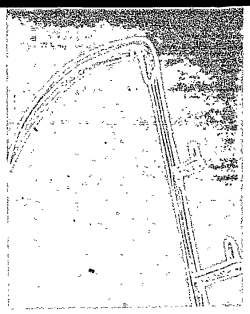
DONDO DOUBLE-PLOUGHSHARE ROTATING FRAME PLOUGH

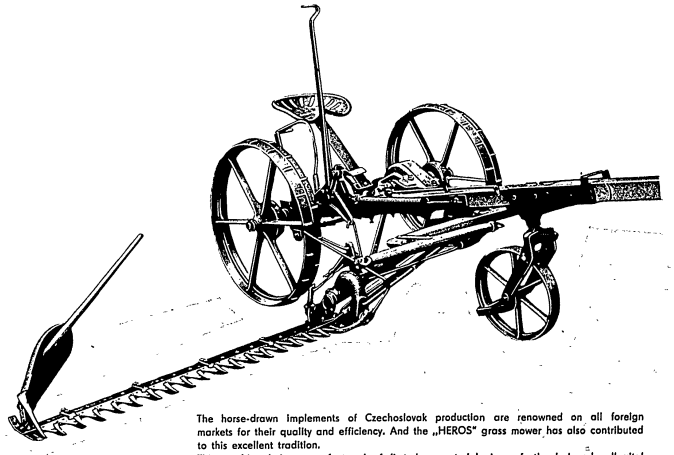




This plough enables farmers in mountainous regions to use the advantages of ploughing by multiple ploughshare ploughs. The DONDO plough has a relatively small weight, very simple steering and guarantees a great output. It works reliably in all conditions, when ploughing to the right as well as to the left. The ploughing depth is controlled by the front lever, during which it is necessary to adjust the setting stops on the rear lever segment so that a uniform depth with both the front and rear ploughshares is achieved. The turning of the ploughshare can be very comfortably executed by means of the rear lever by turning the plough, driving it into a furrow and then adjusting the ploughshares for reverse ploughing. The DONDO plough is built for self-steering and it is therefore not necessary to hold it when working. During transport the ploughshare is set horizontally. The adequate distance of the ploughshares from the ground enables transport even on very bad roads.

THE "HEROS" GRASS MOVER





The horse-drawn implements of Czechoslovak production are renowned on all foreign markets for their quality and efficiency. And the „HEROS" grass mower has also contributed to this excellent tradition.
This machine being manufactured of first-class materials is perfectly designed; all vital points are equipped with ball bearings fully enclosed in a sealed oil bath. This feature secures smooth run of the "HEROS" mower. The master gear is made of quality cast iron, whereas the pinion engaging the master gear is manufactured of high-grade steel. The driving mechanism is engaged and disengaged by two foot operated pedals located on the frame of the mower at either side of the seat. The height of stubble is controlled partly by two vertically adjustable shoe soles, partly by adjusting the cutting angle of the cutter bar by means of a hand control lever. Three different positions of the cutter bar are possible: the horizontal working position, the semi-raised intermediate position and the vertical transport position. The lifting mechanism of the cutter bar consists of a pedal and a hand lever. Three types of cutter bar are available: standard, medium-cut and low-cut. The "HEROS" mower may be supplied with a long pole having a caster wheel, with a long pole without the caster wheel or with a swinging pole and a caster wheel. On special request the mower may be equipped with thills. The cutter bars of the "HEROS" mower are manufactured in three sizes according to their different cutting width: 109 cm (3 and ½ ft.), 123 cm (4 ft.) and 138 cm (4 and ½ ft.). The mower may be used for the mowing of cereal crops, too, if it is provided with a grain board or a hand operated reaping attachment.

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HEROS

SPECIFICATIONS

type of mower	horse-drawn.
working width	109, 123 and 138 cm
weight	370 kg
overall height	1700 mm
overall length	2450 mm
overall width	1850 mm

performance at a speed of 4 km/hr:

cutter bar with cutting width of 109 cm	4 ha/10 hr
cutter bar with cutting width of 123 cm	4,5 ha/10 hr
cutter bar with cutting width of 138 cm	5 ha/10 hr

4 km/h

As we are constantly improving and developing the construction and design of our machines and implements, all specifications as well as illustrations should not be regarded as binding.

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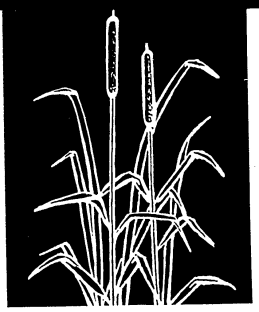
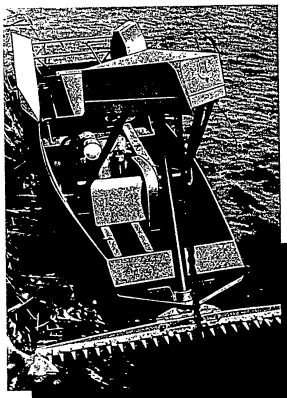
THE ESOX B2 WATER WEED LAUNCH





ESOX

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ESOX B2

SPECIFICATIONS

cutting width	2100	mm
maximum cutting depth	1500	mm
length of launch	5400	mm
width of launch	1400	mm
overall length	7200	mm
overall width	2100	mm
draught	210	mm
weight	1000	kg
output within 8 hr.	6	ha

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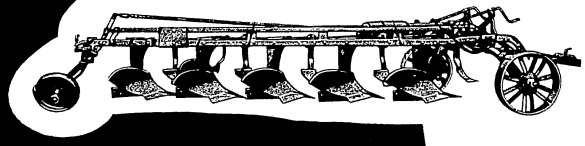
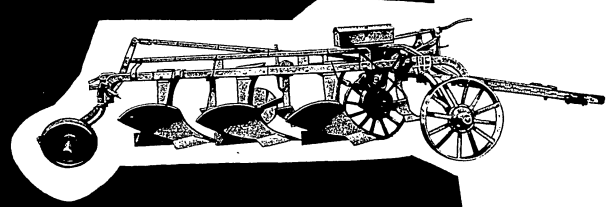
THE 3-PZ-35 AND THE 5-PZ-35 THREE-FURROW TRACTOR DRAWN PLOUGHS





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3-PZ-35 5-PZ-35

Both ploughs are designed to operate in cereal crops and technical crops, e. g. flax, hemp etc. with specific soil resistance of 1.2 kg/cm² with a ploughing depth of 30 cm. According to the soil resistance the 3-PZ-35 plough can be hitched behind tractors of 35—55 HP, whereas the 5-PZ-35 plough is drawn by tractors of 50—80 HP.

On both types of these tractor drawn ploughs one plough share is removable, so that the plough may be converted in a two-furrow or four-furrow one. The cutting width of one plough share amounts to 35 cm on both types. All parts of the plough are connected by means of bolts or pins, thus allowing an easy and quick assembly as well as disassembly. The 3-PZ-35 and the 5-PZ-35 tractor drawn ploughs may be used when ploughing fields with maximum soil resistances without any danger of damage. Reasonable longitudinal spacing of plough shares and high ground clearance of the frame eliminate clogging when ploughing in manure or remains of plants. The required bigcutting depth may be successfully substituted by so called deepening while using the sub-soilers, which are available on special order, also particular bodies with a full set of disc coulters for ploughing meadows and pastures are available on special order. A number of parts and groups being the same on both types enables an easy interchange, when desired.

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TLZ 120

ded construction. All bearings are provided with pressure lubricators and are filled with vaseline. The gearboxes are filled with oil.

Its perfect construction, quality material and high output make the TLZ 120 flax tearing machine an indispensable aid in the harvesting of this technical plant.

Standard accessories: A jack, a grease gun, a tool-box with a set of wrenches and the most important spare parts.

TECHNICAL DATA

Transport length	2500 mms
Transport undercarriage wheel-track	1270 mms
Working length	2600 mms
Working undercarriage wheel-track	1310 mms
Working width	2500 mms
Working height	1250 mms
Weight including transport undercarriage	925 kgs
Machine (theoretical) engagement	120 cms
Average output in the case of dry, upright, weed less and high flax of medium density	4—6 ha per 8 hrs.
Required tractor output	25 HP

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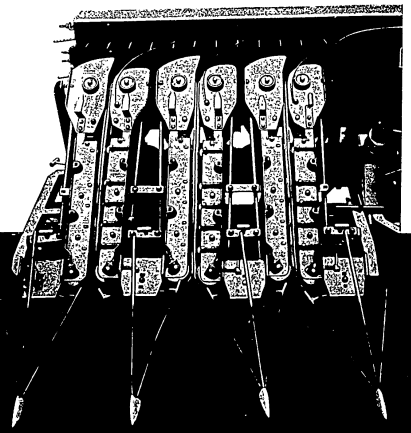

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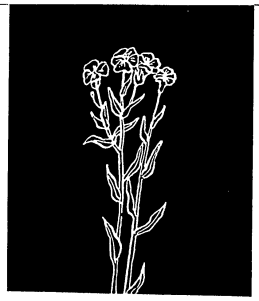
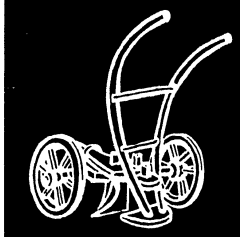
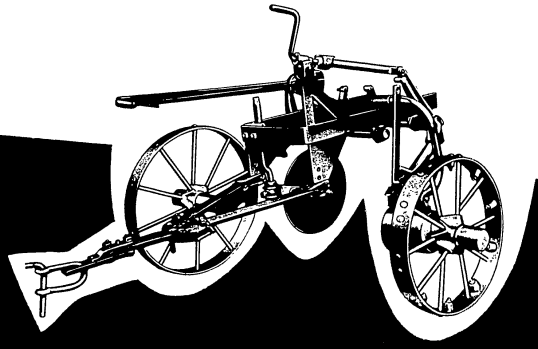
TLZ 120 FLAX TEARING MACHINE



THE UPS UNIVERSAL FORECARRIAGE





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UPS

the U 322 attachment must a 30 HP type of tractor be used. The standard equipment of the UPS universal forecarriage includes 2 spanners and a hand grease — gun.

SPECIFICATIONS

Overall length	1760 mms
Overall width	1530 mms
Overall height	1280 mms
Ground clearance below frame	700 mms
Max. adjustment of land wheel	40 cms
Weight	190 kgs

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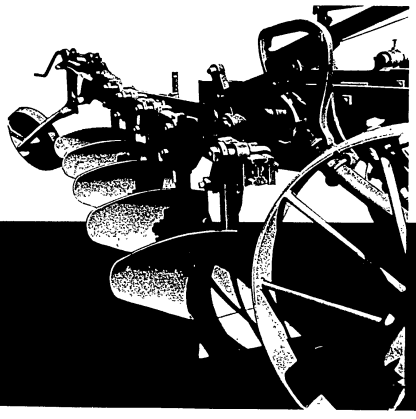

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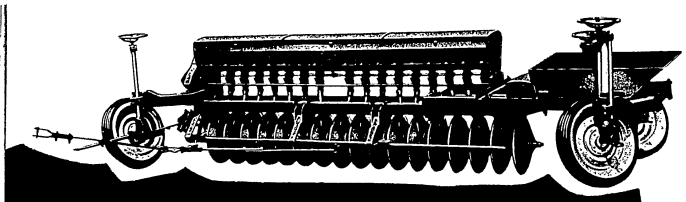
PPTZ 250
FIRST-PLOUGHING DISC TRAILING PLOUGH



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PPTZ-250

TECHNICAL DATA:

a) PPTZ 250:

Overall transport length	5200 mms
Overall transport width	1900 mms
Overall height	1200 mms
Clearance of working disc during transport and use of rubber-covered wheels	200 mms
Diameter of moving rubber-covered wheels	670 mms
Number of moving rubber covered wheels	3 pcs
Diameter of disc	500 mms
Number of discs	17 pcs
Overall weight (less seed-case)	1090 kgs
Overall working length	4800 mms
Overall working width	3950 mms
Working engagement at 35° disc axis declination from perpendicular to direction of drive	2500 mms
working depth	5–8 cms

Max. towing power on hook at max. soil resistance of 90 kg/dm²	900 kgs
First-plougher processes on an average	1,35 ha p. h.
Working speed	6 k. p. h.
Transport speed on rubber-covered wheels	12 k. p. h.
Transport speed on tyres	16 k. p. h.

b) Seed gear:

Overall length of seed-case	2880 mms
Overall width of seed-case	360 mms
Overall height of contents of seed-case	320 mms
Number of seed-boxes	17 pcs
Capacity of box	155 lit.
Weight of seed-gear	175 kgs
Weight together with first-plougher	1265 kgs

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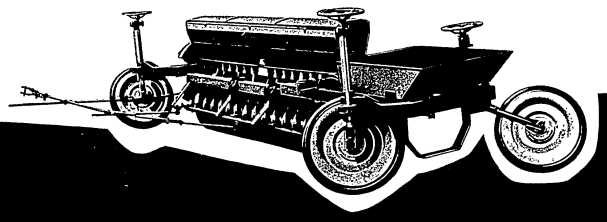

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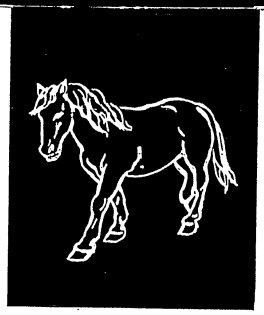
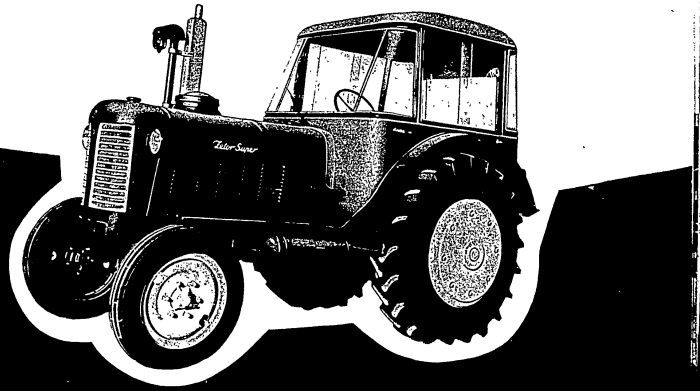
ZETOR SUPER TRACTOR CABS





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SPECIFICATION

	Wheeled	Tracklayer
Overall length with tractor	3450 mm	3200 mm
Overall width with tractor	1650 mm	1700 mm
Overall height with tractor	2450 mm	2250 mm
Length of cab	1600 mm	1600 mm
Width of cab	1400 mm	1400 mm
Height of cab	1600 mm	1060 mm
Inside length	1550 mm	1550 mm
Inside width	1350 mm	1350 mm
Inside height above seat	1180 mm	1000 mm
Weight of cab	98 kg	95 kg
Weight of two seats	7 kg	9 kg
Voltage	12 V	12 V

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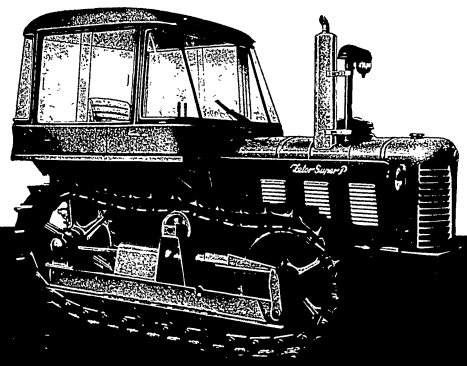

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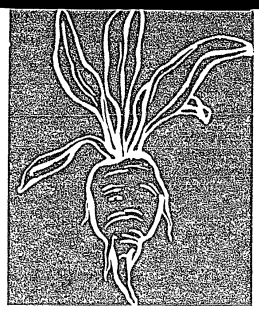
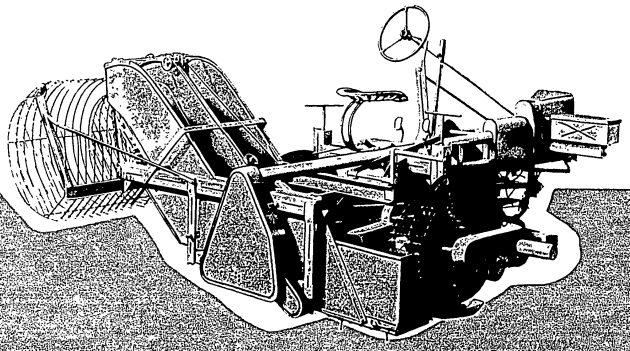
THE 1 SKŘ BEET HARVESTER





The 1 SKŘ beet harvester is designed for harvesting sugar-beet growing on plots which are at least 300 m long. The machine is hitched behind a tractor; it can be successfully operated particularly with the ZETOR 25 K row crop tractor.

The 1 SKŘ beet harvester has two basic working elements: the topper and the lifter. The topping device is mounted on the parallel-link double-arm suspension which represents a novelty in the design of beet harvesters and enables the roots with leaves of different growth to be topped according to their own size. The tops are forwarded by a conveyor-fan into the topping device into the hopper. The lifting mechanism consists of lifting shares, cleaning rollers (shakers) and conveying rollers. Rotary star wheels, which are situated near the lifting bodies, assist the lifted roots to pass continuously onto the conveying rollers. The spiral surface of these rollers conveys the roots which are subsequently cleaned of the soil by a shaking action of the cleaning rollers. The cleaned roots proceed to the main cross elevator which conveys them into the hopper.

On special request the beet harvester can be supplied with a conveyor which loads the roots or the tops directly onto an accompanying trailer. Discharging of the hopper is carried out by the operator of the harvester by means of a foot lever. The machine is steered with a steering wheel. The beet harvester, which is attached to the drawbar of a tractor, is raised and lowered by means of the hydraulic power lift of the tractor.

The way of lifting and topping the roots points to the fact that the operation of the beet harvester is of a high quality. The quantity of soil remaining on the roots varies from 2 to 5 p. c. The topping mechanism operates with an accuracy of 92 p. c. to 100 p. c. of correctly topped roots, which have been inspected and corrected before lifting them from the ground, are

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1 SKŘ

lifted and conveyed to the hopper. It is, therefore, not necessary to inspect and the roots deposited in the heaps.

SPECIFICATIONS

Overall length	4500 mm
Overall width	3150 mm
Overall height	1600 mm
Weight	750 kg
Drawing tractor	ZETOR 25 K
Number of rows	1
Output in 8 hours	0,8 ha

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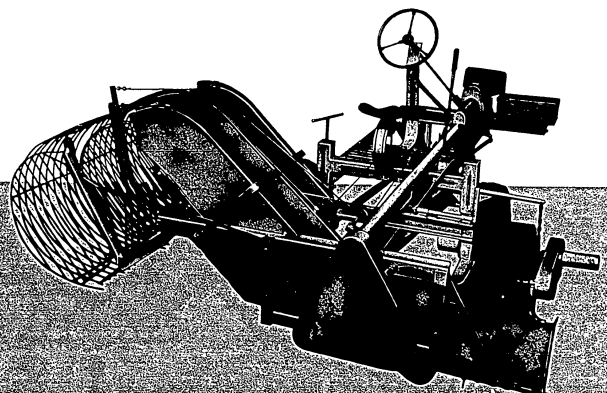
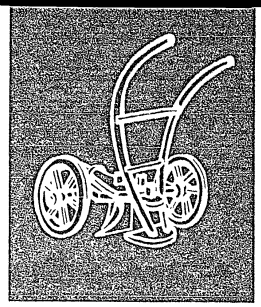
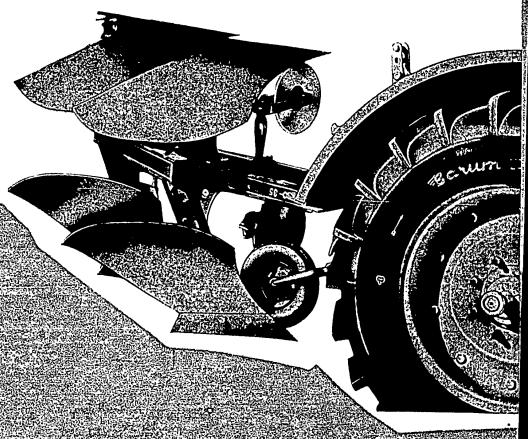


MOTOKOV
PRAHA • CZECHOSLOVAKIA

Sz: 01-30980-57-a

THE 2 PNO 35 TWO-FURROW MOUNTED REVERSIBLE PLOUGH





This plough is designed for medium and deep ploughing of smaller and medium-large sloping plots as well as for one-way ploughing of level fields laid out in lands. The implement is of very solid and sturdy construction and is, therefore, suited for work in the most unfavourable conditions. The 2 PNO 35 reversible plough is designed for stronger categories of tractors, particularly for the ZETOR SUPER wheel tractor, with hydraulic power lift.

The plough consists of 3 main parts:

1. The plough head, i. e. the stationary part which does not rotate when reversing the ploughing bodies. The head is coupled to the tractor by means of the three-point suspension.
2. The frame with working and control attachments. The frame is turnable in the plough head. The left-hand and right-hand ploughing bodies are located opposite one another, so that the frame with the bodies is reversed at an angle of approx. 180°. Reversing is done by means of the hydraulic power lift of the tractor. The frame as well as the bottoms, made of first-class material, are of strong construction.
3. The automatic reversing attachment. One part of this attachment, i. e. the leaf springs, are located on the rear part of the tractor, the second part (the disengaging mechanism) being mounted on to the plough head.

The plough is further equipped with a depth adjusting wheel which maintains a uniform cutting depth.

One of the main features of the 2 PNO 35 two-furrow mounted reversible plough is its high output. Quality material, sturdy construction and long service life fully guarantee that the 2 PNO 35 plough may become one of the best implements of its kind.

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2 PNO 35

TECHNICAL DATA

Overall length	2100 mm
Overall width	1200 mm
Overall height in working position	1350 mm
Overall height in transport position	2200 mm
Length of plough including tractor	5500 mm
Ground clearance in transport position	520 mm
Weight	410 kg
Distance between plough shares	700 mm
Ground clearance of frame	600 mm
Maximum specific soil resistance	90 kg/dm²

Number of plough bottoms (U-35 type)	2 right-hand and 2 left-hand
Cutting width of 1 plough bottom	350 mm
Working width of plough	700 mm
Maximum cutting depth	270 mm

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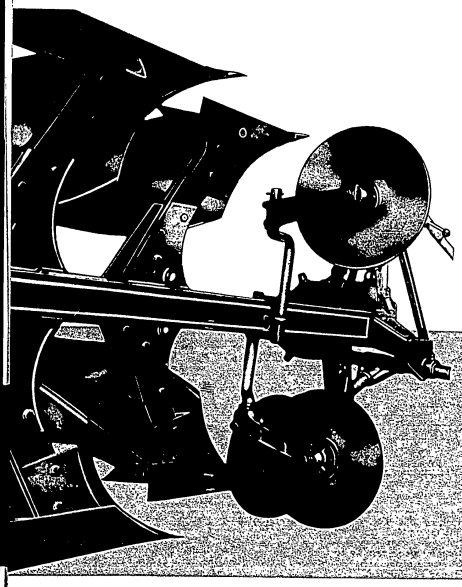

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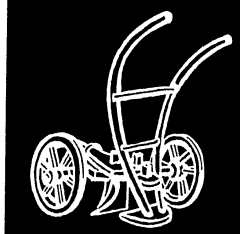
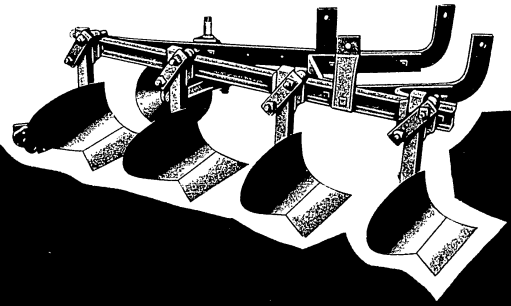
THE U 41 ATTACHMENT





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U 41

SPECIFICATIONS

	Without forecarriage	With forecarriage
Overall length	1680 mm	2970 mm
Overall width	1190 mm	1530 mm
Overall height	650 mm	1280 mm
Ground clearance below frame	405 mm	
Longitudinal spacing of bottoms (in direction of movement of tractor)	400 mm	
Cutting width of one bottom	25 cm	
Total working width	100 cm	
Maximum working depth	15 cm	
Weight of attachment with accessories	175 kg	369 kg
Draft required on hook at specific soil resistance of 60 kg/dm²	900 kg	
Approx. performance at 5 km/hr speed* (maximum working depth)	0,33 ha/hr	

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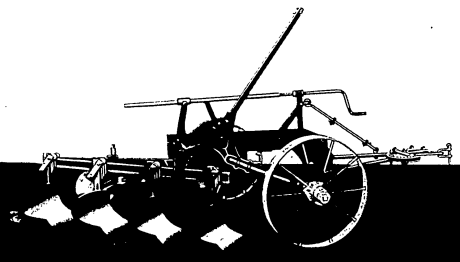

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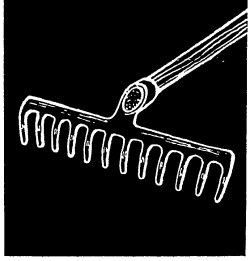
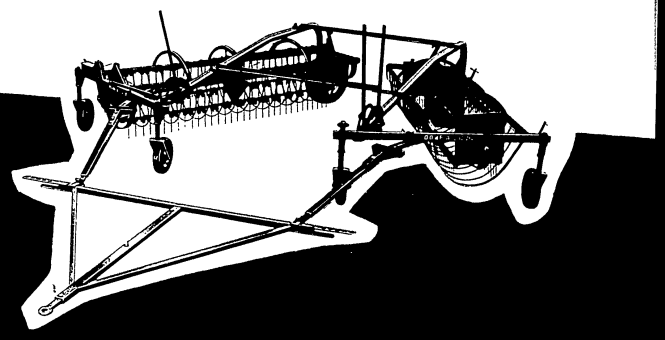
THE 2-SZ-210 TRACTOR-DRAWN SIDE DELIVERY RAKE AND SWATH TURNER





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2-SZ-210

TECHNICAL DATA

Dimensions of one unit:

Length	5000 mm
Width	2200 mm
Height	1600 mm
Weight	495 kg
Operation width	2100 mm
Most suitable working speed	7—8 km/h
Travel speed	18 km/h
Rear wheel (tyre)	6.00—16
Roadstead wheels	16×4.00
Operating width of both units, coupled into V for raking	5200—6000 mm
Operating width of both units coupled for swath turning	4400 mm
Operating width of both units coupled for double-row swath turning	4400—5200 mm
Necessary traction power	about 300 kg
Attendance for preliminary work	labourer and tractor driver
Attendance during operation	tractor driver only.

Owing to constant development in construction all the above-mentioned data and illustrations are not to be considered as binding.

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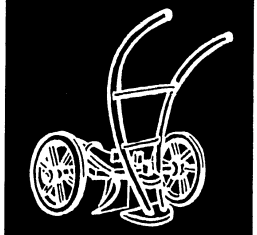
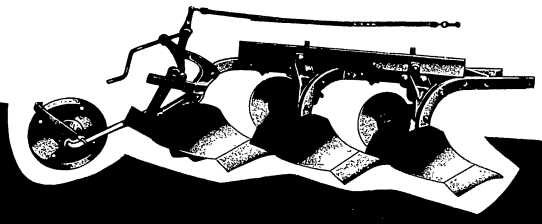
THE U 322 ATTACHMENT





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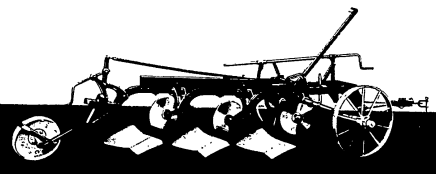
U 322

SPECIFICATIONS

	Without forecarriage	With forecarriage
Overall length	2800 mm	4090 mm
Overall width	1250 mm	1530 mm
Overall height	490 mm	1280 mm
Ground clearance below frame	540 mm	
Longitudinal spacing of bottoms (in direction of movement of tractor)	615 mm	
Cutting width of one bottom	30 cm	
Total working width	90 cm	
Maximum working depth	28 cm	
Weight of attachment with equipment	345 kg	535 kg
Draft required on hook at specific soil resistance of 60 kg/dm² (maximum working depth)	1405 kg	
Approx. performance at 5 km/hr speed	0,42 ha/hr	

As we are constantly improving and developing the construction and design of all our machines and implements, no specifications or illustrations should be regarded as binding.



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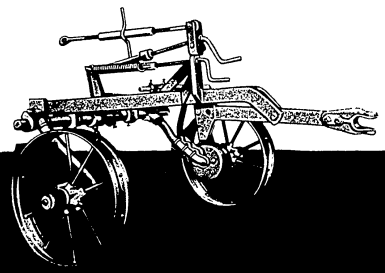
HZ 41

SPECIFICATIONS

Overall length of forecarriage	1,755 mm
Overall width of forecarriage (wheel tread being 1,350 mm)	1,640 mm
Overall height of forecarriage	1,115 mm
Weight of forecarriage (including cross clamps)	240 kg

As we are constantly improving and developing the construction and design of all our machines and implements, the specifications and illustrations should not be regarded as binding.



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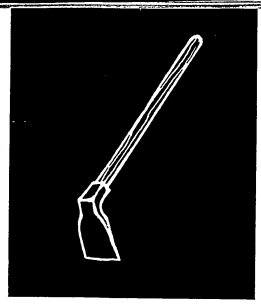
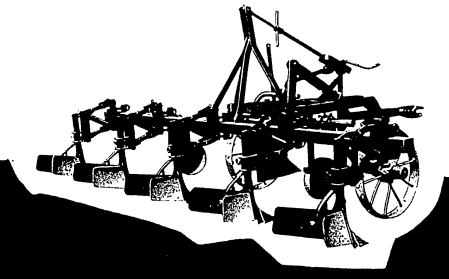
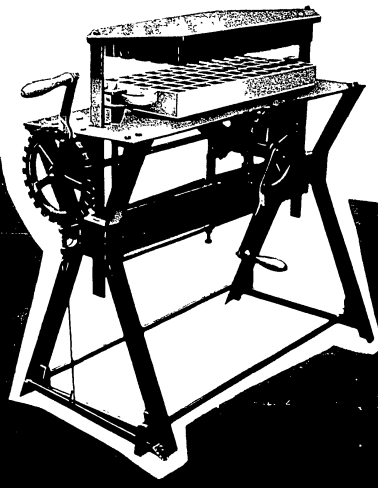
THE HZ 41
TRACTOR-DRAWN HILLER





THE VAJMA
EARTH CUBE PRESS



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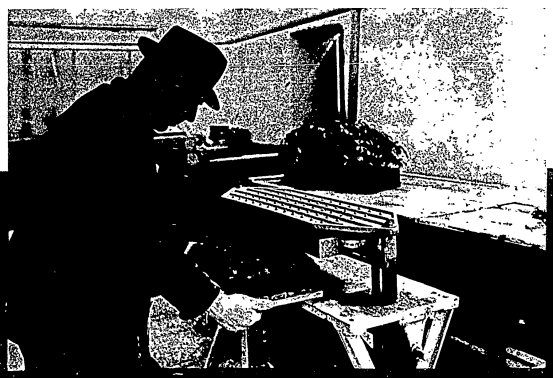
VAJMA

TECHNICAL DATA

Ramming press length	1150 mm
Ramming press width	850 mm
Ramming press height	1250 mm
Electromotor revolutions	220/380 V
Electromotor input	1 KW
Ramming press weight	230 kg
Extruding press length	1220 mm
Extruding press width	630 mm
Extruding press height	1040 mm
Extruding press weight	130 kg
Number of pigeon-holes	60 pieces/1 grate
Size of pigeon-holes	40×40×55
Weight of grate	7 kg

The whole set includes: 1 stamping press with electromotor, 1 delivery press and 9 pieces of grate.

The whole set includes: 1 ramming press with electromotor, 1 extruding press and 9 grates and illustrations are not binding.



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EL-S-4500

TECHNICAL DATA

Chics Incubator:

Incubating cabinet:

height	1735 mm
width	1925 mm
depth	1100 mm
weight	400 kg
capacity	2800 medium-sized eggs
input	1100 W

Hatching cabinet:

height	1735 mm
width	1270 mm
depth	1100 mm
weight	270 kg
capacity	1000 medium-sized eggs
input	810 W

Duck Incubator:

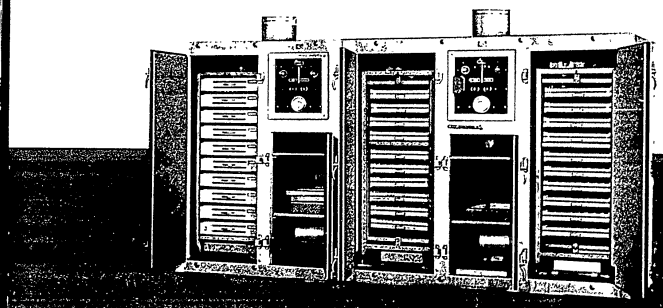
Incubating cabinet:

height	1735 mm
width	1925 mm
depth	1100 mm
weight	440 kg
capacity	1400 medium-sized eggs
input	1120 W
unter-carriage (weight)	24 kg

Hatching cabinet:

height	1735 mm
width	1925 mm
depth	1100 mm
weight	280 kg
capacity	670 medium-sized eggs
input	810 W

In view of constant development the data and illustrations must not be considered as binding.



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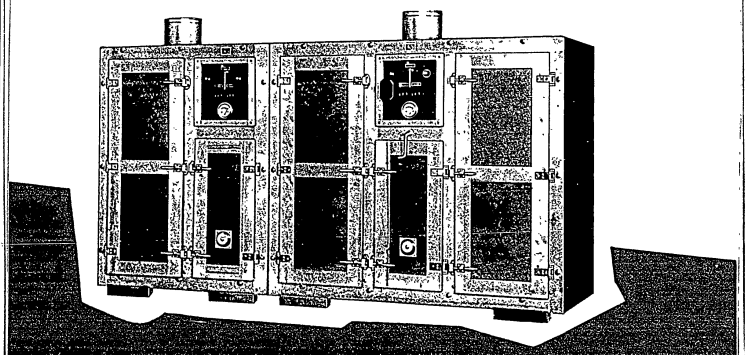
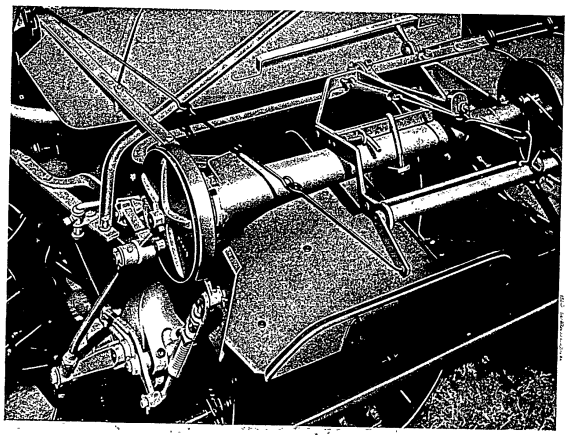
THE EL-S-4500
ELECTRIC INCUBATOR



TECHNICAL DATA

Drive	By the tractor P. T. O.
Cutting width	1830 mm
Finger spacing	76 mm
Section spacing	76 mm
Stroke	152 mm
Diameter reel	1630 mm
Width in working position	4600 mm
Width in transport position	3100 mm
Height	2350 mm
Length	3950 mm
Weight	1020 kg
Performance at 5 km/hr	0,9 ha

In view of constant development no data or illustrations should be considered as binding.



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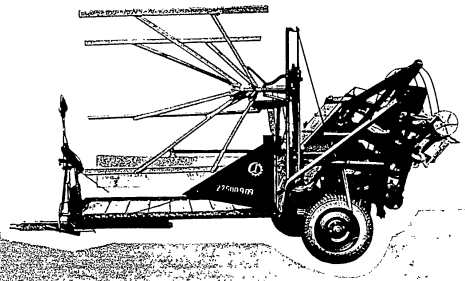
THE MBK 183 TRACTOR BINDER



The new MBK 183 grain binder is a very efficient machine for all kinds of grain. It is a right-cutting type with cutting width of 183 cm. The binder is driven from the tractor P. T. O. shaft. Its frame is made of angle and flat steel. Transmission gears are enclosed and run in oil baths. A slip clutch on the driving shaft safeguards the machine against overloading.

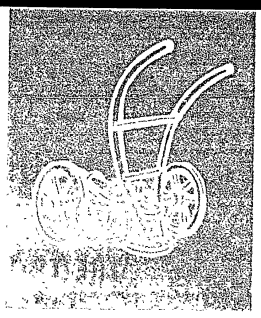
The table can be lowered or lifted by means of hand — operated on the main as well as grain wheels. The rail is adjustable horizontaly as well as vertically. The binding attachment can be adjusted by means of levers for long or short grain. The levers are easily controlled from the operator's seat.

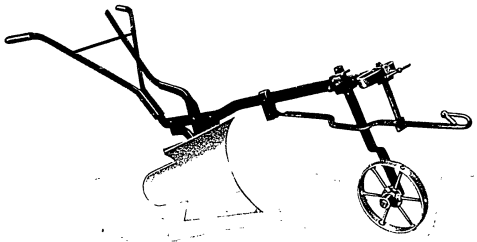
Easy running of the binder is ensured by 18 ball and 9 roller bearings lubricated by pressure lubricators. The knotter can be adjusted for different kinds and thicknesses of the twine as well as for various degrees of tightening and sizes of the sheafs.

The transport as well as the grain wheels are in standard execution made of steel. On special order the wheels with pneumatic tyres are available. The main wheel is of steel, but it can also be supplied with a pneumatic tyre.

A torpedo divider, bundle carrier and grain lifters can be delivered as special accessories. The torpedo and the lifters are necessary for harvesting long and laid-down crop. The MBK 183 binder is suitable for operation with the ZETOR 25 tractor.

THE OPKSO REVERSIBLE PLOUGH





This type of reversible plough being extremely efficient on sloping fields and in hilly regions allows to plough with open furrows or to form ridges.

Its beam is made of steel. The plough is provided with double-wheel forecarriage having straight axle and self-steering device. The double-share bottom provided with a mouldboard of stubble pattern secures good turning of the furrow slices. The plough may be supplied without the forecarriage with a gauge wheel only; this modification is know as the OPKSO St. revesible plough.

The OPKSO and OPKSO St reversible ploughs are well known and favourite trade marks owing to their reliable performance, high ploughing effect and quality material.

SPECIFICATIONS

	OPKSO	OPKSO St.
weight	65 kg	41 kg
working width	21 cm	21 cm
cutting depth	6—15 cm	6—15 cm
equipment	double-wheel forecarriage	gauge wheel

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THE TP 100 SINGLE-FURROW HORSE DRAWN PLOUGH

This plough is designed for simplest plougning in favourable soil and climatic conditions. Low weight, convenient control and reasonable draft required are among the main features of this plough. The TP 100 horse-drawn plough is very popular and it has proved well particularly overseas.
The plough having a curved beam made of flat steel is provided with two handles. The mouldboard manufactured of quality steel sheet is of stubble pattern. Standard equipment of this plough consists of 1 spare share 1 spanner. On special order a gauge wheel may be supplied.

SPECIFICATIONS

weight without gauge wheel	12 kg
working width	17 cm
cutting depth	5—13 cm

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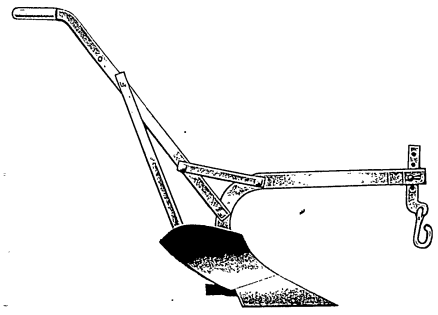

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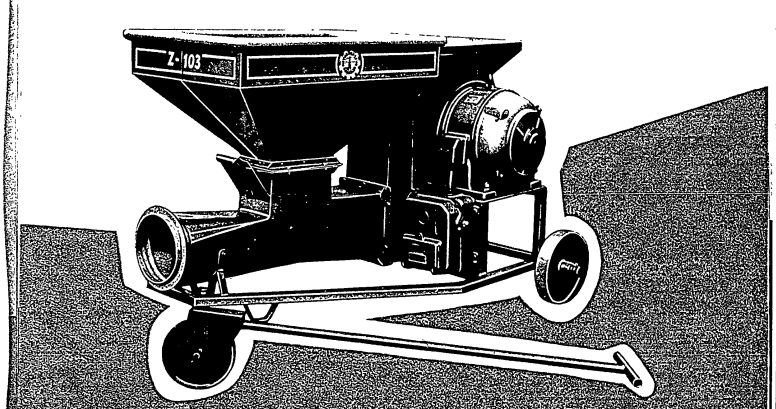
Sz: 01-31028-57-a

THE Z 103 GRAIN BLOWER



The Z-103 grain blower is a device for conveying grain and seed material. It is most suitable for medium size farms. It means economy of labour, and does away with drudgery. Its operation and maintenance are extremely simple.
The grain blower consists of a fan, a hopper and pipeline. The fan is of steel and is mounted on the electromotor shaft. Into the extension piece attached to the fan housing opens the hopper. The discharge end is provided with a flange for connecting further pipes by means of clamps. To the forecast end may be attached a deflector which directs the grain to the desired place.
The usual accessories of the blower are: 2,5 m of pipes, 3 elbows of 90°, a special deflector and 18 clamps.

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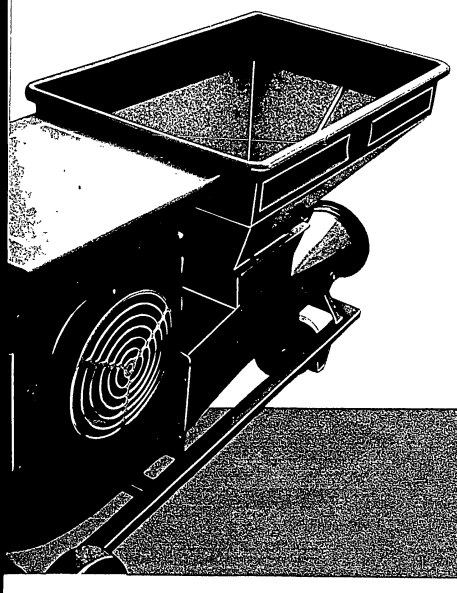
Z 103

TECHNICAL DATA

Length	1600 mm
Width	960 mm
Height	1400 mm
Weight	380 kg
Diameter of pipes	250 mm
Working capacity	6000 kg/h
Conveying range max.	50 m
Conveying height max	20 m
Engine input	7,5 KW
r. p. m.	2800 l/min.

Owing to a constant development in construction all the above mentioned data and illustrations are not to be considered as binding.



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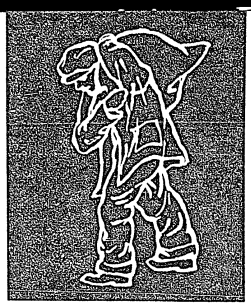
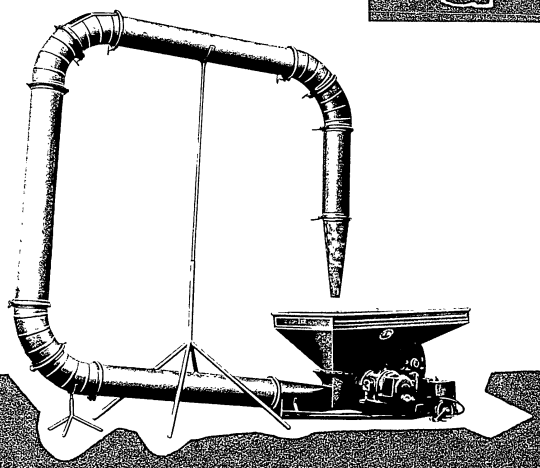
Stč 01-30514-57-a

THE Z 102 GRAIN CONVEYOR





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Z 102

SPECIFICATIONS

Output	120 q/hr
Overall length in transport position	max. 60 m
Overall height in transport position	max. 35 m
Required power input of electric motor	12 kW
Revolutions	1430 R. P. M.
Weight (without accessories)	460 kg
Diameter of pipes	300 mm

The standard equipment includes: 31 m of pipes, 5 elbows, 1 special deflector and 25 quick-acting ring couplings.

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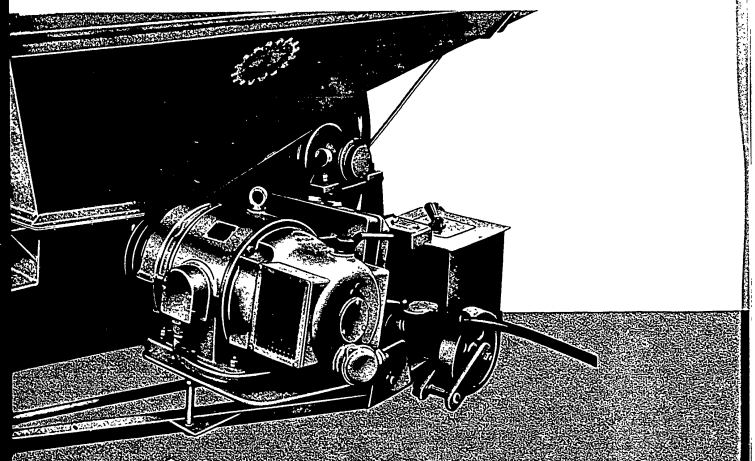

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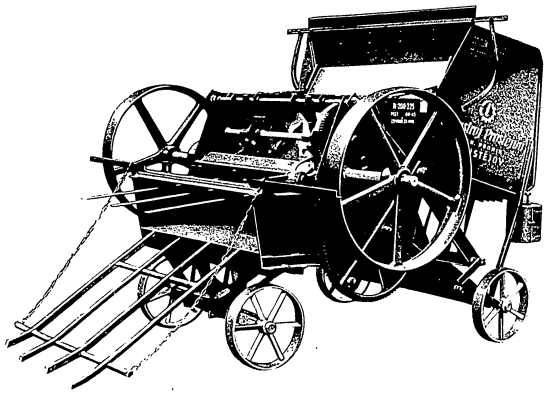
THE LSP 130 STRAW BALER



The LSP 130 straw baler is designed for binding straw into bales or for its transportation up to the stack. The baler is designed to be operated in a set with the MA-90 thresher, but it may be as well used with any other thresher of the same capacity.

The frame of the baler is a welded steel construction mounted on a four-wheel undercarriage. The wheels are of steel and are mounted on roller bearings. The pendulum compressor is assisted by a fly-wheel to ensure uniform motion. The main shaft is mounted on ballbearings, the other shafts are fitted in bushings. The straw and cavings are conveyed into the intake throat by means of steel feed- boards. The pressed and bound straw is delivered on the steel sliding rails made of section steel. The baler has a double binding attachment which is driven from the main shaft by gears. The binding attachment is designed in such a way that it may be adjusted to bind bales of three various sizes. For binding, hemp, sisal and paper twine may be used.

The outstanding feature of the LSP 130 baler is its high capacity at a low weight. Its construction and material guarantee its long service life.

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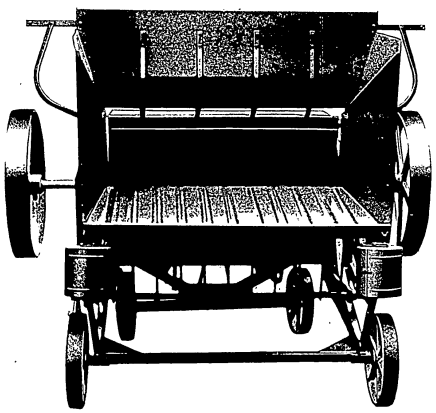
TECHNICAL DATA

Length	2600 mm
Width	2700 mm
Height	1970 mm
Weight	1025 kg
V-belt pulley diameter	900 mm
Revolutions	200/225 r p m
Delivery end cross section	1300 × 300 mm
Wheel tread of front axle	1200 mm
Wheel tread of rear axle	1550 mm
Wheel diameter	450 mm
Capacity	30–35 q/h

Owing to a constant development of construction the above mentioned data and illustrations are not binding.



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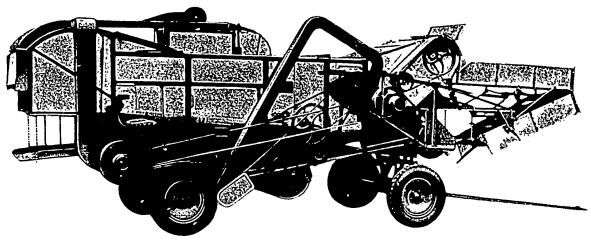
Sč: 01-30976-57-a

THE MA 90 THRESHER



The MA 90 Thresher is an up-to-date efficient machine requiring for its attendance 3—4 persons only. The thresher has an automatic conveyor, a speed and volume governor, a band cutter and a feeding drum, so that we can put into the thresher uncut sheaves. Sheaves are put into the vertically adjustable trough of the conveyor. The threshing drum is 900 mm wide and is provided with ribbed beaters. The concave consists of two parts. The thresher is equipped with double cleaning and rotary screen. Chaff and cavings are conveyed straight to the storing place by means of a blower. The thresher is an all metal construction with a sturdy welded frame. The wheels are fitted with tyres and mounted on roller bearings.

On the rear wheels are expanding brakes. The thresher is towed by a tractor and is for this purpose equipped with a short shaft to be hitched to the tractor. A built-in electromotor, equipped with starting and switching devices, serves as driving unit. The thresher can be driven by any stationary engine of adequate capacity. To the thresher may be mounted a clover huller. By exchanging pulleys the thresher may be adopted for threshing legumes. The capacity is on average 20 q of grain per hour. The thresher MA 90 incorporates the long tradition of Czechoslovak threshers and represents the most up-to-date type.

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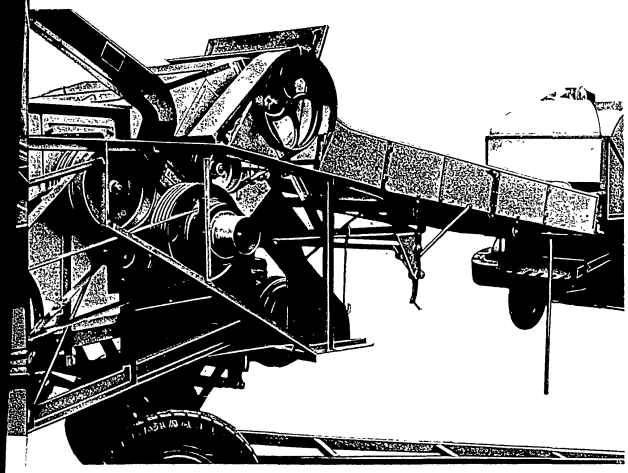
TECHNICAL DATA

Machine length in working position	9750 mm
Machine length in transport position	7950 mm
Machine width in working position	2460 mm
Machine width in transport position	2460 mm
Machine height in working position	2960 mm
Machine height in transport position	2860 mm
Machine weight	3800 kg
Threshing drum diameter	550 mm
Threshing drum width	900 mm
Threshing drum revolutions	1180–1200 mm
Wheelbase	3190 mm
Track front	1900 mm
Track rear	1950 mm
Tyres	6,50–20"
Electromotor	25 KW, 380/220 V
Electromotor revolutions	2960 r p m
Normal capacity per hour	20 q wheat with grain to straw proportion 43.5 %: 56.5 %, humidity 16 %

Owing to a constant development in construction all the above mentioned data and illustrations are not to be considered as binding.



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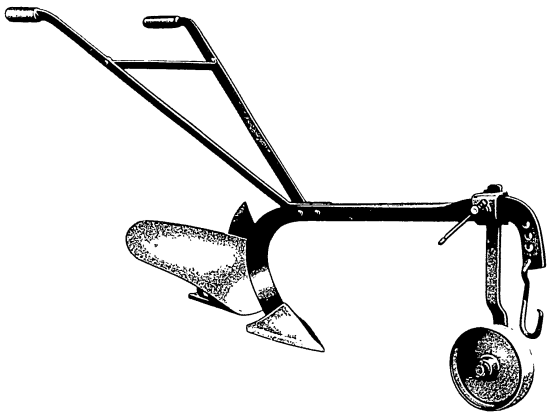
Sč: 01-30979-57-a

THE HPV 1 HORSE-DRAWN HILLER



The HPV 1 horse-drawn hiller is designed for hilling potatoes and other row crops. It is of simple, but solid construction provided with handles, a gauge wheel and adjustable ridging bodies. The hiller is drawn by one horse.

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SPECIFICATIONS

Working width	max 500 mm
Cutting depth	6—12 cm
Weight	29 kg

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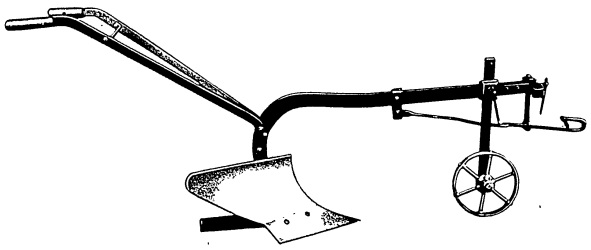

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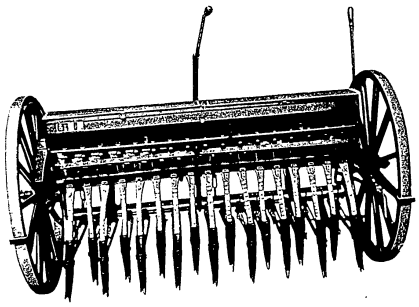
Stt 01-30720-57-a

THE 17-SVBP-105 HORSE DRAWN SEED DRILL



The 17-SVBP-105 Horse drawn seed drill takes up a place of honour in the series of seed drills of Czechoslovak origin. This implement is designed for sowing smaller areas or fields in hilly regions. It can be also used for sowing cereal crops or other similar seeds. The overshot discharge of grain is used for drilling small or large grains, the undershot for cereals.

The 17-SVBP-105 horse drawn seed drill is of a very light construction, which isn't, however, to the detriment of the rigidity and sturdiness of the implement. This seed drill is designed to be drawn by a horse team consisting of one pair of medium-strong horses. It is an implement with external force-feed mechanism of fluted roller type designed for both overshot and undershot discharge of grain. The seed drill is provided with a double-wheel forecarriage enabling the implement to be guided with its front wheel accurately in the track left by the rear wheel.

As already mentioned, the 17-SVBP-105 seed drill can also be used when other kinds of crops similar in size and mode of drilling to cereals are sown. The overshot discharge of grain permits drilling of large seeds with easily damaged husks as well as sowing of small fine seeds. After extending the shoe type furrow openers to the desired width also sugar-beet, sun-flower seeds, etc. can be sown by this seed drill.

Convenient design and first-class material guarantee an outstanding performance and long life of this implement.

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SPECIFICATIONS:

Overall length with double-wheel forecarriage	3100 mm (10 2")
Overall length with pole	6085 mm (19 11 3/4")
Overall width	2240 mm (7' 4 1/8")
Overall height	1550 mm (5 1 3/4")
Working width	1785 mm (5 10 1/2")
Wheel track	2000 mm (6 6 1/4")
Inter-row spacing	105 mm (4 9/64")
Hopper capacity	100 dm^3 (6.102 cu. in)
Weight	420 kg (926 lb)
Maximum working speed	4—5 km/hr (2 1/2—3 m/h)
Output per hour at a speed of 5 km/hr (3 m/h)	0,83 ha (2 acres)
Number of rows	17

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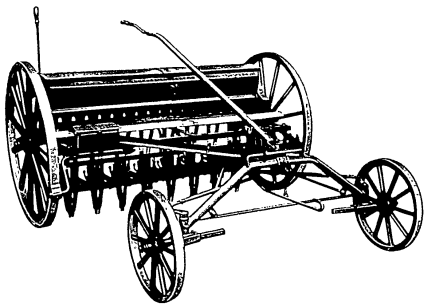

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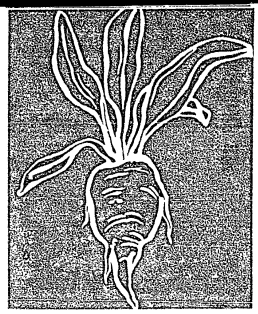
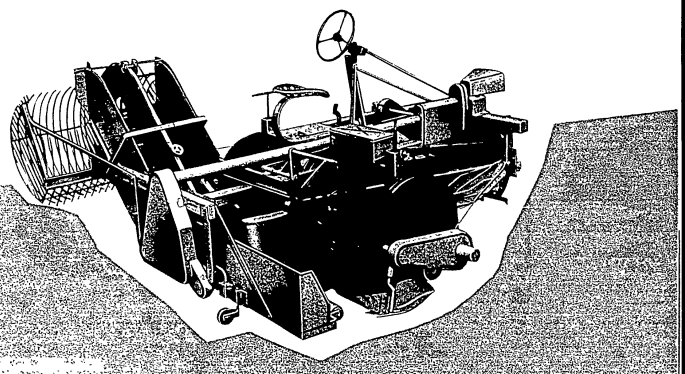
THE 2 SKŘ B BEET HARVESTER





The 2 SKŘ B beet harvester is designed for harvesting sugar-beet growing on plots which are at least 300 m long. The basic working elements of the machine are the topper and the lifter. The topping device is installed on the right side of the machine and its feeler is driven by the right land wheel of the harvester. This arrangement of the topper guarantees that the topped roots can be inspected before they are lifted, allows eventual corrections by hand topping and ensures all lifted roots to be correctly topped. It is, therefore, not necessary to inspect the roots deposited in the heaps. The topping device includes a wheel type feeler which is driven by means of a chain from the land wheel. The feeler arm is provided with a solid knife, the elongated cutting edge of which forms a chute for the tops. A guide for pushing aside the beet-leaves is mounted in front of the land wheel. The lifting mechanism consists of lifting shares, cleaning rollers (shakers) and conveying rollers. Near the lifting bodies there are situated rotary star wheels which assist the lifted roots to pass continuously onto the rollers. The spiral surface of these rollers conveys the roots which are cleaned of the soil by shaking action of the cleaning rollers. The cleaned roots proceed to the main cross elevator, the front part of which conveys the roots whereas its rear part forwards the tops into the hoppers. On special request a conveyor can be supplied which loads the roots or the tops directly onto an accompanying trailer.

The beet harvester can be lifted by means of crankscrews by vertical adjustment of the main supporting wheels. The topping device is lifted by a hand lever from the driver's seat. Discharging of the hopper is carried out by the operator of the harvester by means of foot levers. The machine is steered by a steering wheel.

The SKŘ 2 beet harvester is manufactured of high quality material. It operates precisely and economically. The quantity of soil remaining on the roots varies from 2 to 5 p. c. The topping mechanism operates with an accuracy of 90 p. c. Inspection and correction of the topped roots, which is carried out before they are lifted from the ground, guarantees 100 p. c. of correctly topped roots in the hopper.

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2-SKŘ-B

SPECIFICATIONS

Weight	950 kgs
Number of rows	2
Output in 8 hours	1,5 ha
Inter-row spacing	45 cms
Overall length	4500 mms
Overall width	3600 mms
Overall height	1600 mms

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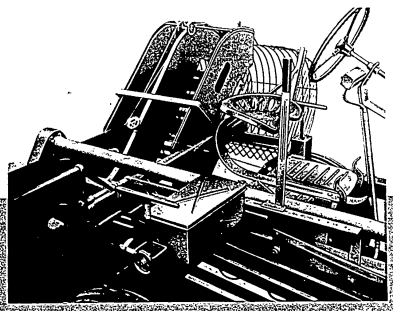

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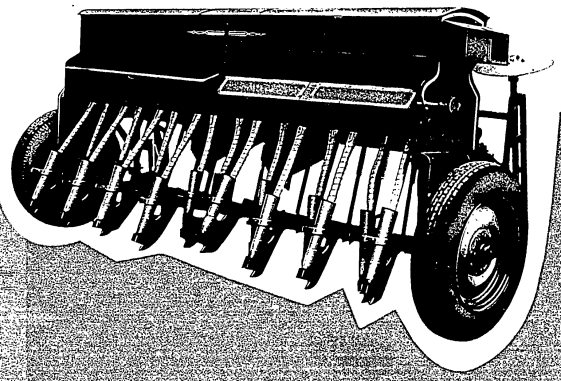
Sz: 01-30711-57-a

THE 16-SLN-150 MOUNTED SEED DRILL WITH ADJUSTABLE CUPS



The 16-SLN-150 mounted seed drill with adjustable cups is a general purpose implement adapted for hitching to the hydraulic power lift of a tractor. The machine is used for drilling cereal crops as well as for sowing all technical crops including those which have large seeds, such as beans, etc. In this implement is provided with a standard cup-feed mechanism which has proved its good features in such an excellent way in the case of the world-famous UNIKUM seed drills. The standard knife-shaped furrow openers are arranged in one row. The seed drill can be attached as a mounted implement to a tractor with a hydraulic power lift. It can, however, also be converted either into a tractor-drawn implement by providing it with a tractor hitch, or into a horse-drawn seed drill by attaching a double wheel forecarriage with automotive type steering to the implement. When used as a mounted implement, the seed drill is carried only during road transport and when turning on headlands; when working, the implement runs on wheels with pneumatic tyres and its feed mechanism is driven from the left-hand wheel. The drive of the feed mechanism is automatically stopped when the seed drill is raised by the hydraulic power lift of the tractor; the furrow openers are lifted at the same time. The seed drill is equipped with markers which are located on its front part and operated by the tractor driver. The implement can be attached to the ZETOR 25 A or ZETOR 25 K Diesel tractor with the short as well as long links of the hydraulic power lift. Among the advantages of the 16-SLN-150 mounted seed drill are indisputable: The use of wheels with pneumatic tyres contributes to a higher working speed of up to 8 km/hr. Also the travelling speed is higher, amounting to 10 km/hr. When drilling, the soil is not rammed as in the case of using wooden or steel wheels. Turning of the implement on headlands is carried out quickly, easily and with the minimum turning radius. The seed drill, the operation of which is very simple, runs on ball bearings; its run is, therefore, very smooth. The cup-feed mechanism is of a well-proven design and discharges all kinds of seeds with incomparable accuracy. The seed drill can easily be stored owing to its small dimensions.

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16-SLN-150

SPECIFICATIONS

Overall length	1,450 mm
Overall width	2,830 mm
Overall height	1,350 mm
Working width	2,400 mm
Number of rows	16
Inter-row spacing	150 mm
Number of beet rows	6
Spacing of beet rows	450 mm
Hopper capacity	150 dm³
Pneumatic tyres	5,3"×16
Wheel track	2,700 mm
Working speed	3.5—8 km/hr
Output at 8 km/hr. speed	1.5 ha/hr.
Maximum travelling speed	10 km/hr
Total weight	approx. 500 kg

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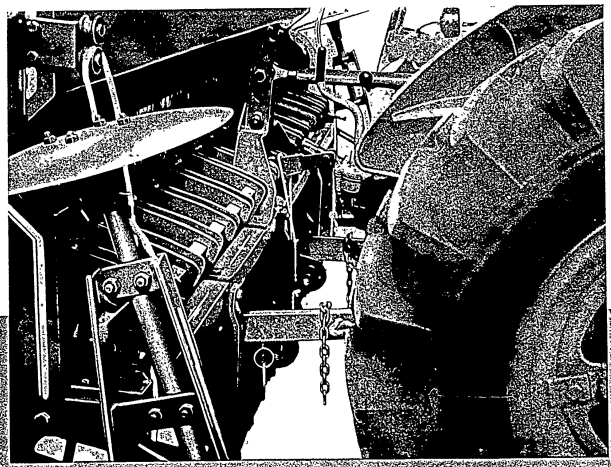

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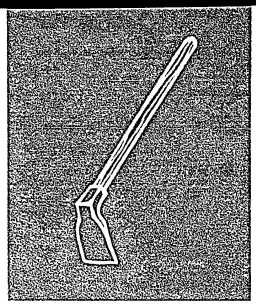
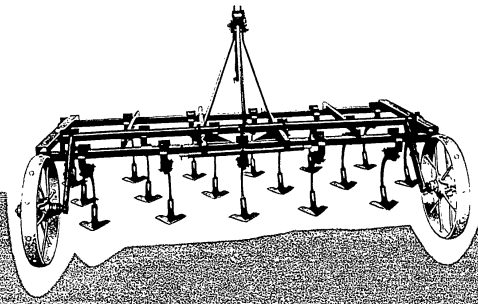
SC: 01-30708-57

THE KN 170 P MOUNTED CULTIVATOR





The KN 170 P mounted cultivator is used for general soil tillage, breaking up of the soil crust and effective weed control. It may be conveniently operated behind the ZETOR-25 A and K Diesel tractors, with hydraulic power lift.

The frame of this implement is built of welded channel sections. The spring tines are arranged in three rows and attached to the frame by means of welded tightening stirrups. These seventeen spring tines are spaced at 150 mm intervals. The double-point shovels may be reversed after their working points become blunt. The upper part of the semi-rigid shank may be replaced by an arrow-shaped sweep for preparing seed beds and killing weeds. Extirpator shovels and spring tines are interchangeable. Maximum working depth of this cultivator is 12 cms. The working width is controlled by vertical adjustment of two supporting wheels mounted on a common shaft (crank axle). This shaft is pivoted to the front frame beam and runs on ball bearings. The working depth may be changed by means of a screw-type mechanical distance control which is attached to the driver's seat on the tractor. The working tools are arranged in three rows and are longitudinally spaced at larger intervals thus eliminating any clogging of the cultivator.

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KN 170 P

SPECIFICATIONS

Overall length	1840 mms
Overall width	2480 mms
Overall height	1305 mms
Total working width	2550 mms
Number of tines	17
Longitudinal spacing of tines	150 mms
Approximate weight	300 kgs

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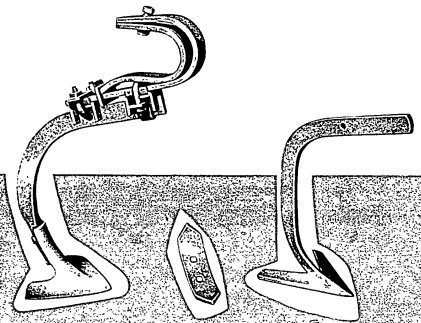

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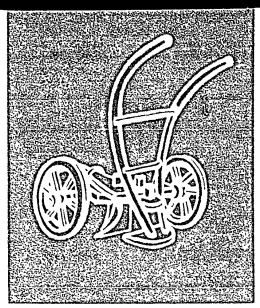
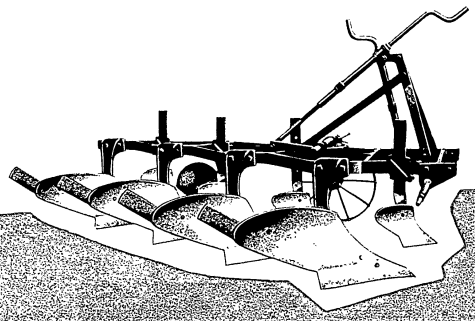
THE 4-PN-30 FOUR-FURROW MOUNTED PLOUGH





This type of mounted plough is very suitable for deep ploughing in all kinds of soil. The sturdy frame of the plough is made of quality material and provided with four bottoms of the U-30-1 type. The plough is equipped with four skim coulters and with a disc coulter in front of the rear bottom. On the left-hand side of the plough there is a land wheel that strictly follows the contour of the ground surface during the ploughing action thus controlling the working depth. A scraper mounted into this land wheel removes the clinging earth. The working depth as well as working width are controlled by means of two long adjusting screws with cranks which are easily accessible from the driver's seat. The 4-PN-30 four-furrow mounted plough may be converted into a three-furrow unit by removing the rear section of the frame with a mounted-on bottom, replacing the land wheel with its axle and readjusting the screw type control.

Longitudinal spacing of bottoms amounts to 63 cms, this distance being sufficient enough to eliminate any clogging of the plough. The 4-PN-30 four-furrow mounted plough is designed for operation behind the ZETOR SUPER Diesel tractor with hydraulic power lift. The 4-PN-30 four-furrow mounted plough represents an up-to-date novelty of the Czechoslovak farm machinery industry. Its well proved design, quality material and easy attendance guarantee the high performance and long durability of this plough.

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4-PN-30

SPECIFICATIONS

Overall length	2870 mms
Overall width	1510 mms
Overall height	1430 mms
Weight	460 cms
Cutting width of one bottom	30 cms
Total working width	120 cms
Maximum working depth	24 cms

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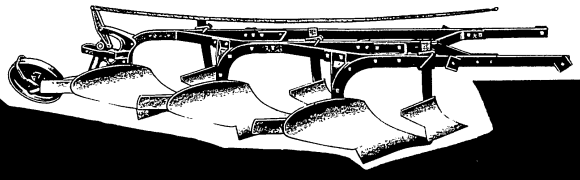
THE USL 32 ATTACHMENT



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UL 22 · USL 32

THE UL 22 ATTACHMENT

The UL 22 two-furrow attachment may be used for ploughing meadows up to a maximum working depth of 25 cms. Assembled with the UPS forecarriage it forms the MARS UL 22 plough. The frame of the attachment is manufactured of quality steel and the mouldboards are made of three-layer, soft centre armour steel hardened to 500 according to Brinell hardness test. The UL 22 attachment is connected to the forecarriage by means of four bolts. When heavy soils are handled the second side beam can be replaced by a brace, thus providing a single-furrow attachment. The UL 22 attachment is characterized by the considerable longitudinal spacing of the bottoms, eliminating any clogging of the plough· its convenient design makes it possible to obtain an outstanding performance even in the most difficult soil conditions when used with skim coulters.

The standard equipment of the UL 22 attachment includes two disc coulters 380 mms in diameter. One of them is mounted on to the attachment, the other being fitted to the universal forecarriage. Further accessories of this attachment consist of two skim coulters, two spare shares and one socket wrench with a handle for the rear wheel axle.

The UL 22 attachment is designed for operation behind a ZETOR 25 Diesel tractor or with other types of 25 HP tractors.

SPECIFICATIONS

	UL 22		USL 32	
	Without forecarriage	With	Without forecarriage	With
Overall length	3000 mms	4290 mms	3430 mms	5595 mms
Overall width	960 kgs	1530 mms	1300 mms	1836 mms
Overall height	940 mms	1280 mms	900 mms	1150 mms
Ground clearance below frame	560 mms		560 mms	
Longitudinal spacing of bottoms	850 mms		850 mms	
Cutting width of one bottom	30 cms		30 cms	
Total working width	60 cms		90 cms	
Maximum working depth	25 cms		28 cms	
Weight of attachment including accessories	260 kgs	450 kgs	416 kgs	696 mms
Draft required on hook at specific soil resistance of 60 kg/dm²	935 kgs		1512 kgs	
Approx. performance at 5 km/hr speed	0.29 ha/hr		0.38 ha/ha	

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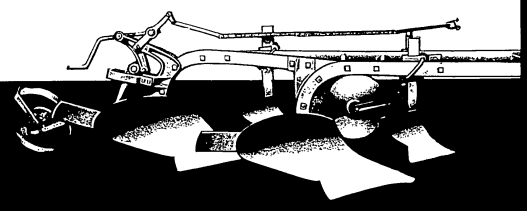

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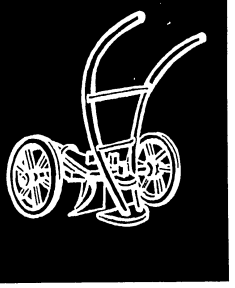
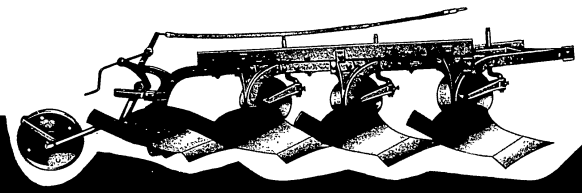
THE US 432 ATTACHMENT





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US 432

SPECIFICATIONS

Overall length	3515 mms
Overall width	1550 mms
Overall height	940 mms
Ground clearance below frame	540 mms
Longitudinal spacing of bottoms (in direction of movement of tractor)	615 mms
Cutting width of one bottom	30 cms
Total working width	120 cms
Maximum working depth	26 cms
Draft required at specific soil resistance of 60 kg/dm²	1870 kgs
Weight of attachment including accessories	485 kgs
Approx. performance at 5 km/hr speed	0.56 ha/hr

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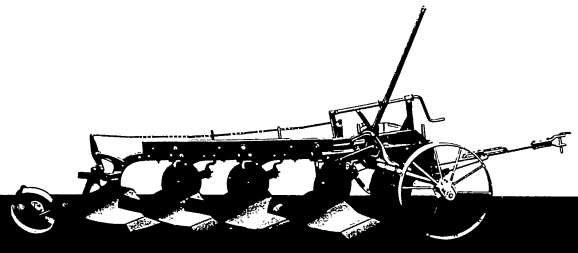

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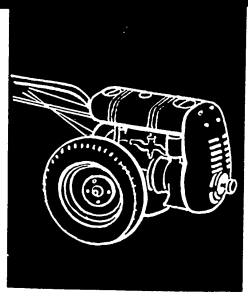
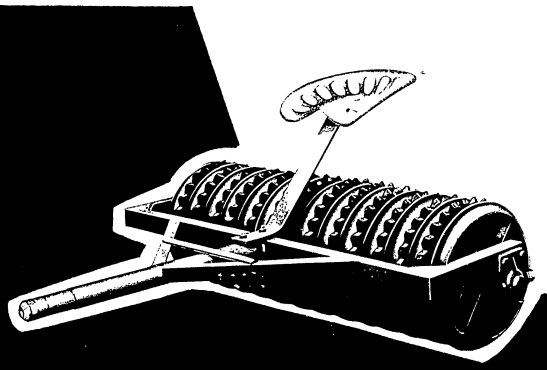
THE VCM 125 CAMBRIDGE ROLLER





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VCM-125 BDM-100

THE BDM 100 DISC HARROWS

The BDM 100 disc harrows are a tractor-drawn implement operated with the MOTOROBOT PF 6 garden tractor; they are successfully used for seed bed preparation and for ploughing in stubble. The implement consists of 4 right-hand and 4 left-hand steel discs mounted on separate shafts which are pivoted to the frame by means of hangers. Each shaft runs on two large bearings equipped with grease nipples. The hubs for both hangers as well as the pin fitting the universal coupling head of the MOTOROBOT tractor are welded onto the frame. Swivel-mounting of the hangers makes it possible to change the cutting angle of the disc gangs and to work the soil more effectively. The discs are secured in the desired position by means of a bolt fitting into the holes on the adjusting quadrant. A cultivador type spring tooth, mounted on the frame between both of the disc gangs, makes it possible to handle the soil which has been left untouched by the discs. For road transport the harrows are equipped with 2 disc wheels dia. 250 mms made of sheed iron. Standard equipment: 1 grease gun.

SPECIFICATIONS:

Overall length	860 mms
Overall width	995 mms
Overall height	735 mms
Working width	1000 mms
Weight	94 kgs

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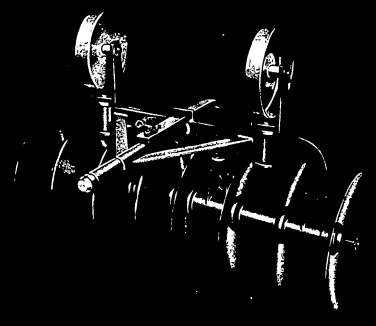
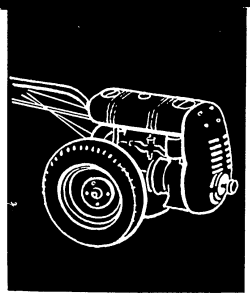
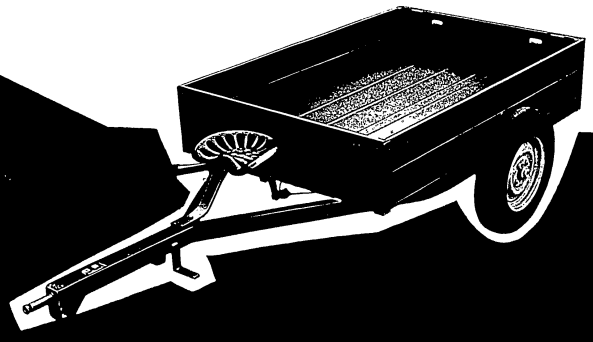


THE PV 81 TRAILER





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PV-81

SPECIFICATIONS:

Overall length	3800 mms
Overall width	1750 mms
Overall height	850 mms
Weight	260 kgs
Floor area	2100×1350 mms
Height of sideboards	350 mms
Wheel track	1600 mms
Pneumatic tyres	6,00—16
Load carrying capacity	800 kgs

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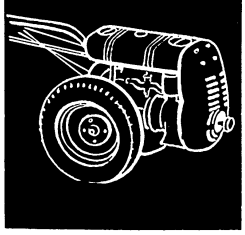
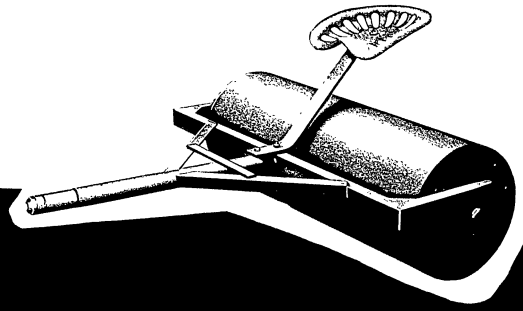
THE VF FLAT ROLLER





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VF-ZM-12

THE ZM-12 POWER BRUSH

The ZM—12 power brush is a multi-purpose implement suitable for sweeping courts, parks, sports grounds and pavements, and for removing light snow, etc.
The rotary brush is attached to the PF 6 MOTOROBOT garden tractor by means of a flange and four bolts. This type of suspension affords the brush the necessary freedom of movement and enables it to adapt itself to the ground surface. The ZM—12 power brush is driven from the countershaft in the transmission housing of the MOTOROBOT tractor by means of bevel gears and a chain. The driving mechanism is protected against dust and dirt. The bevel gears run in an oil bath and their shafts are provided with ball bearings. The brush is engaged and disengaded by means of a dog clutch.
The brush body is a hollow wooden cylinder. The bunches of elastic and tough grass are arranged in a close spiral and held firmly to the cylinder by a rope. The cylinder rotates freely on its shaft which is installed in the supporting frame; this shaft can be easily removed should it be necessary to disassemble the cylinder. The brush can be easily adjusted in vertical direction by means of crank screws raising or lowering the two rear supporting wheels. In its upper part the brush is screened with a sheet iron shield.

SPECIFICATION

Overall length	1700 mms
Overall width	1700 mms
Weight	160 kgs
Overall height	650 mms
Brush diameter	450 mms
Working speed	4-5 kg/hr
Working width	1265 mms
Length of brush	1400 mms
Pneumatic tyres of supporting wheels	BANTAM 12X6

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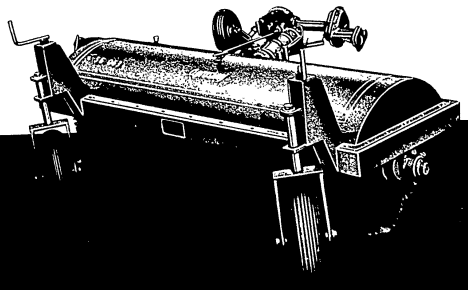

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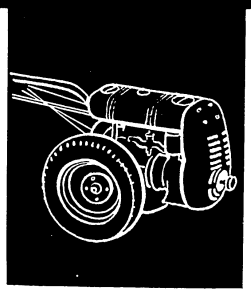
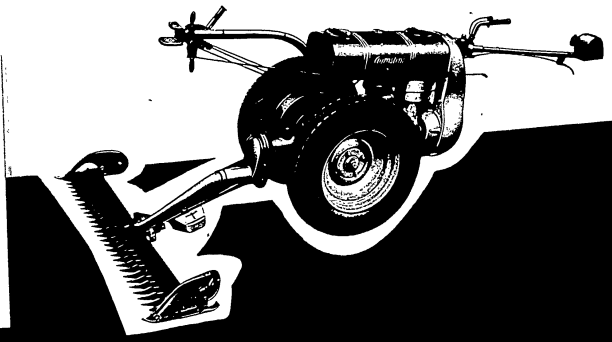
THE Ž 151 MOWER





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Ž-151

SPECIFICATIONS

Overall length	1120 mm
Overall width	1560 mm
Overall height	460 mm
Weight	110 kg
Working width	1520 mm
Working speed (reverse speed of the MOTO-ROBOT tractor)	3,5 km/hr

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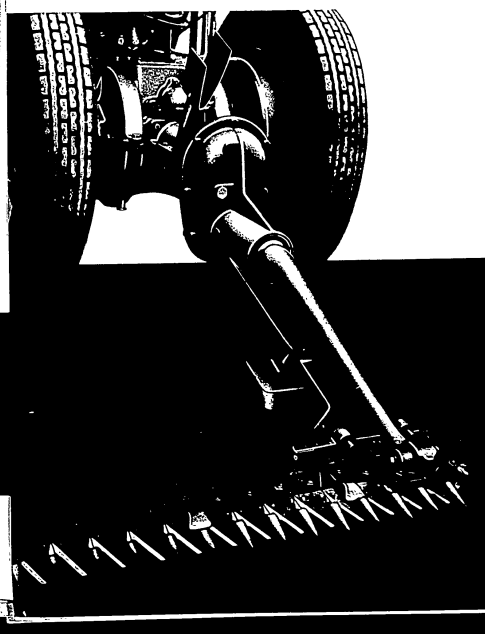
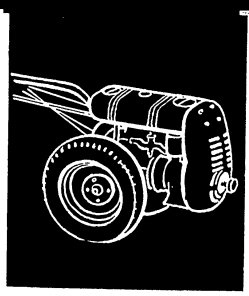
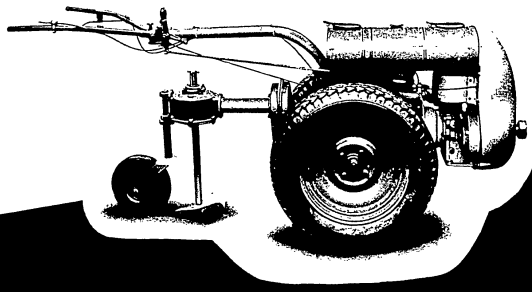


THE VLM LIGHT TYPE POST HOLE DIGGER





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VLM

SPECIFICATIONS

Overall length	1000 mm
Overall width	300 mm
Overall height	750 mm
Weight	60 kg
Diameter of holes	280 mm
Maximum digging depth	300 mm
Auger shaft speed	178 r.p.m.
Wheel with pneumatic tyre BANTAM	12×4

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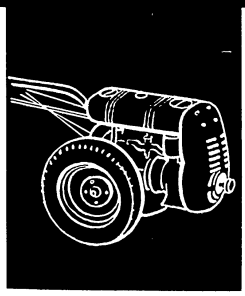
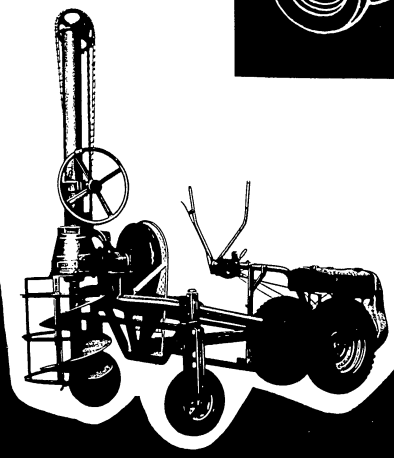
THE VM HEAVY TYPE POST HOLE DIGGER





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VM

SPECIFICATIONS

Overall length	2150 mms (7'3/4")
Overall width	1420 mms (48")
Overall height	2600 mms (8'6 3/8")
Weight	340 kgs (749 lb)
Augers diameter	300 and 450 mms (11 13/16" and 17 23/32")
Maximum digging depth	700 mms (27 9/16")
Auger speed	160 r. p. m.
Wheel with pneumatic tyres	BANTAM 16 × 4
Output	
35 holes 700 mm (27 9/16") deep dia. 300 mm/hr (11 13/16")	
22 holes 700 mm (27 9/16") deep dia. 450 mm/hr (17 23/32")	
Number of operators	1—2 persons

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Hardware A

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Hardware A

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NOTICE

When ordering goods please state the whole Order Number and designation of the product, e. g.: 201 A/105 — Cold Chisels.
We reserve to us the right of altering illustrations. The weights and dimensions given are not binding.

HINWEIS

Bei Warenbestellung wollen Sie stets die vollständige Bestellnummer und Warenbezeichnung anführen, zum Beispiel: 201 A/105 — Schlossermeißel.
Wir behalten uns das Recht vor, die Erzeugnisse mit allfälligen Abweichungen von den Abbildungen zu liefern. Die angegebenen Gewichte und Abmessungen sind unverbindlich.

AVIS

Dans la commande veuillez toujours mentionner le numéro de commande complet et la désignation de l'outil — par example: 201 A/105 — Bédanes de serrurier.
Droit de modification des illustrations reservé.
Les dimensions et les poids sont indiqués sans aucun engagement de notre part.

ADVERTENCIA

Al formular el pedido de mercancías sírvanse siempre indicar el número de orden completo y nombre de la respectiva pieza, por ej.: 201 A/115 — Cinceles para cerrajeros.
Nosotros nos reservamos el derecho de cambiar las ilustraciones. Las dimensiones y pesos indicados son sin compromiso de parte nuestra.

GOLA SPANNERS AND WRENCHES · „GOLA"-SCHLÜSSEL · CLEFS GOLA · LLAVES GOLA PARA TUERCAS

1 A/228 — 1 A/230

GOLA FLATSPANNERS. Double ended — head incline 15° — made of chrome-vanadium steel, of light design and appropriate shape. Chromium plated, with polished heads; or black with polished heads.

CLEFS PLATS GOLA doubles, inclinaison des têtes 15°, en acier au chrome-vanadium, modèle léger, forme convenable, chromées, têtes polies; ou noir, têtes polies.

FLACHE „GOLA"-GABELSCHLÜSSEL, doppelseitig, Neigung der Köpfe 15°, aus Chrom-Vanadium-Stahl, leichte Ausführung, zweckmäßige Form; verchromt oder geschwärzt mit polierten Köpfen.

LLAVES GOLA DOBLES, llanas — inclinación de cabezas 15° — de acero cromo al vanadio, en ejecución ligera, forma racional, cromadas, cabezas pulidas; o negras con cabezas pulidas.

Order No Bestell-Nr. No. de cde. Número del pedido	Opening of the spanner Maulweite / ouverture de la clef / abertura de la llave		Length / Länge longueur / longitud		Thickness of the head Kopfstärke / ouverture des têtes / espesor de la cabeza		Weight / Gewicht / poids peso	
	mm	"	mm	"	mm	"	g	ozs
PK 19	4 × 5	3/16 × 7/32	100	4	2,5	3/32	15	1/2
PK 20	6 × 7	1/4 × 9/32	120	4 3/4	3	1/8	25	7/8
PK 21	8 × 9	5/16 × 3/8	135	5 1/2	3,5	1/8	35	1 1/4
PK 22	10 × 11	13/32 × 7/16	155	6	4	5/32	50	1 3/4
PK 23	12 × 13	1/2 × 17/32	170	6 3/4	4,5	3/16	70	2 1/2
PK 24	14 × 15	9/16 × 19/32	190	7 1/2	5	7/32	90	3 1/8
PK 25	16 × 17	5/8 × 11/16	205	8	5,5	1/4	125	4 3/8
PK 26	18 × 19	23/32 × 3/4	220	8 3/4	6	1/4	165	5 7/8
PK 27	20 × 22	25/32 × 7/8	240	9 1/2	6,5	1/4	220	7 3/4
PK 28	21 × 23	13/16 × 15/16	255	10	7	9/32	260	9 1/8
PK 29	24 × 26	31/32 × 1 1/32	280	11	7,5	5/16	300	10 1/2
PK 30	25 × 28	1 × 1 1/8	295	11 1/2	8	5/16	380	13 3/8
PK 30a	27 × 29	1 1/16 × 1 5/32	315	12 3/8	8,5	3/8	550	19 3/8
PK 31	30 × 32	1 3/16 × 1 1/4	335	13 1/4	9	3/8	620	21 7/8
PK 32	36 × 41	1 7/16 × 1 5/8	390	15 3/8	11,5	7/16	970	34 1/4

Order No. / Bestell-Nr. / No. de cde. / Número del pedido SPK I		Order No. / Bestell-Nr. / No. de cde. / Número del pedido SPK II.	
mm	"	mm	"
4 × 5	3/16 × 7/32	4 × 5	3/16 × 7/32
6 × 7	1/4 × 9/32	6 × 7	1/4 × 9/32
8 × 9	5/16 × 3/8	8 × 9	5/16 × 3/8
10 × 11	13/32 × 7/16	10 × 11	13/32 × 7/16
12 × 13	1/2 × 17/32	12 × 13	1/2 × 17/32
14 × 15	9/16 × 19/32	14 × 15	9/16 × 19/32
16 × 17	5/8 × 11/16	16 × 17	5/8 × 11/16
		18 × 19	23/32 × 3/4
		20 × 22	25/32 × 7/8

Order No. / Bestell-Nr / No. de cde. / Número del pedido SPK III.		Order No. / Bestell-Nr. / No. de cde. / Número del pedido SPK IV.	
mm	"	mm	"
4 × 5	3/16 × 7/32	8 × 9	5/16 × 3/8
6 × 7	1/4 × 9/32	10 × 11	13/32 × 7/16
8 × 9	5/16 × 3/8	12 × 13	1/2 × 17/32
10 × 11	13/32 × 7/16	14 × 15	9/16 × 19/32
12 × 13	1/2 × 17/32	16 × 17	5/8 × 11/16
14 × 15	9/16 × 19/32	18 × 19	23/32 × 3/4
16 × 17	5/8 × 11/16	20 × 22	25/32 × 7/8
18 × 19	23/32 × 3/4	21 × 23	13/16 × 15/16
20 × 22	25/32 × 7/8	24 × 26	31/32 × 1 1/32
21 × 23	13/16 × 15/16	25 × 28	1 × 1 1/8
24 × 26	31/32 × 1 1/32	27 × 29	1 1/16 × 1 5/32
25 × 28	1 × 1 1/8	30 × 32	1 3/16 × 1 1/4

Order No. / Bestell-Nr. / No. de cde. / Número del pedido SPK V.		Order No. / Bestell-Nr. / No. de cde. / Número del pedido SPK VI.	
mm	"	mm	"
4 × 5	3/16 × 7/32	4 × 5	3/16 × 7/32
6 × 7	1/4 × 9/32	6 × 7	1/4 × 9/32
8 × 9	5/16 × 3/8	8 × 9	5/16 × 3/8
10 × 11	13/32 × 7/16	10 × 11	13/32 × 7/16
12 × 13	1/2 × 17/32	12 × 13	1/2 × 17/32
14 × 15	9/16 × 19/32	14 × 15	9/16 × 19/32
16 × 17	5/8 × 11/16	16 × 17	5/8 × 11/16
18 × 19	23/32 × 3/4	18 × 19	23/32 × 3/4
20 × 22	25/32 × 7/8	20 × 22	25/32 × 7/8
21 × 23	13/16 × 15/16	21 × 23	13/16 × 15/16
24 × 26	31/32 × 1 1/32	24 × 26	31/32 × 1 1/32
25 × 28	1 × 1 1/8	25 × 28	1 × 1 1/8
27 × 29	1 1/16 × 1 5/32	27 × 29	1 1/16 × 1 5/32
30 × 32	1 3/16 × 1 1/4	30 × 32	1 3/16 × 1 1/4
		36 × 41	1 7/16 × 1 5/8

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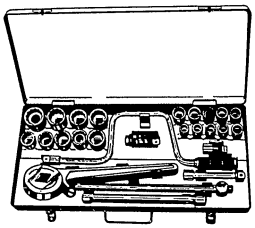
2 A/SN 23 metric system / Millimetersystem / système métrique / sistema métrico

GOLA SOCKET-SET, in steel box. The medium design with the 13 mm square drive. Deep dodecagonal sockets made of chrome-vanadium steel. The ratchet and auxiliary extension-bars made of tool steel, completely chromium-plated.

JEU DE CLEFS À DOUILLE, en boite métallique. Modèle moyen avec carré de 13 mm. Douilles profondes à ouvertures 12 pans, en acier au chrome-vanadium. Cliquet et douilles auxiliaires en acier à outils, complètement chromées.

STECKSCHLÜSSELSATZ in Metallkasten. Mittelschwere Ausführung mit 13 mm großem Verbindungsvierkant. Zwölfkantige Einsätze mit großer Kopftiefe aus Chrom-Vanadium-Stahl. Knarre und Hilfseinsätze aus Werkzeugstahl, ganz verchromt.

JUEGO DE LLAVES TUBULARES en caja de hojalata. Ejecución mediana con un cuadradillo de 13 mm. Llaves tubulares de acero cromo al vanadio con aberturas dodecagonales. Chicharra y alargadores auxiliares de acero de herramientas, completamente cromadas.



The steel box dimensions / Schachtelabmessungen / dimensions de la boite / dimensiones de la caja:
length / Länge / longueur / longitud 480 mm
width / Breite / largeur / ancho 210 mm
height / Höhe / hauteur / altura 50 mm
weight of the set / Gewicht des ganzen Satzes / poids complet du jeu / peso del juego completo: 7 kg

The steel box contains / die Schachtel enthält folgende Stücke / la boite contient / contenido de la caja:

		length / Länge longueur / longitud	
SN 140	Speeder Brace / Kurbel / vilebrequin / manivela	400 mm	16"
SN 148	Plug and Socket Universal Joint / Kardangelenk / articulation à cardan / junta universal	75 mm	3"
SN 148	Sliding Tee Bar / Griff mit Gleitstück / poignée coulissante / barra corediza	320 mm	13"
SN 161	Ratchet / Freilaufknarre / cliquet / chicharra	260 mm	10"
SN 160	Short Extension-Bar / kurzes festes Verlängerungsstück / rallonge raide courte / alargador recio corto	125 mm	5"
SN 161	Long Extension-Bar / langes festes Verlängerungsstück / rallonge raide longue / alargador recio largo	250 mm	10"
SN 162	Screwdriver Bit / Schraubenzieherеinsatz / douille à tournevis pieza adicional del destornillador	50 mm	2"

		opening Maulweite ouverture abertura			opening Maulweite ouverture abertura
SN 167	Socket / Steckschlüsseleinsatz / clef à douille / piezas adicionales de bocas sueltas	12 mm	SN 176	idem	21 mm
			SN 177	idem	22 mm
SN 168	idem	13 mm	SN 178	idem	23 mm
SN 169	idem	14 mm	SN 179	idem	24 mm
SN 170	idem	15 mm	SN 180	idem	25 mm
SN 171	idem	16 mm	SN 181	idem	26 mm
SN 172	idem	17 mm	SN 182	idem	27 mm
SN 173	idem	18 mm	SN 183	idem	28 mm
SN 174	idem	19 mm	SN 184	idem	30 mm
SN 175	idem	20 mm	SN 185	idem	32 mm

2 A/SN 24

Identical with SN 23, only the socket diameters in inches / STECKSCHLÜSSELEINSATZ in derselben Ausführung wie SN 23, jedoch im Inch-System / idem que pour SN 23. Les dimensions des clefs à douille sont en système anglais / así como SN 23, bocas sueltas las mencionamos en pulgadas:

		opening Maulweite ouverture abertura			opening Maulweite ouverture abertura
SN 58	Socket / Steckschlüsseleinsatz / clef à douille / piezas adicionales de bocas sueltas	3/8"	SN 77	idem	25/32"
			SN 78	idem	13/16"
SN 69	idem	7/16"	SN 79	idem	7/8"
SN 70	idem	1/2"	SN 80	idem	15/16"
SN 71	idem	9/16"	SN 81	idem	31/32"
SN 72	idem	19/32"	SN 82	idem	1"
SN 73	idem	5/8"	SN 83	idem	1 1/16"
SN 74	idem	21/32"	SN 84	idem	1 1/8"
SN 75	idem	11/16"	SN 85	idem	1 1/4"
SN 76	idem	3/4"			

Packing: each set separately / Einzelverpackung / Emballage: par 1 pièce / Embalaje: particular.

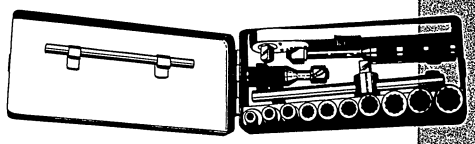
3 A/SL 22

GOLA SMALL SOCKET SET. Light design with 8 mm square drive. Deep dodecagonal sockets made of chrome-vanadium steel. The ratchet and auxiliary extension-bar made of tool steel, completely chromium-plated.

PETIT JEU DE CLEFS À DOUILLE GOLA, modèle léger avec carré de 8 mm. Douilles profondes à ouvertures 12 pans en acier au chrome-vanadium. Cliquet et douilles auxiliaires en acier à outils, complètement chromées.

KLEINER „GOLA"-STECKSCHLÜSSELEINSATZ. Leichte Ausführung mit 8 mm großem Verbindungs-Vierkant. Zwölfkantige Einsätze mit großer Kopftiefe aus Chrom-Vanadium-Stahl. Freilaufknarre und Hilfseinsätze aus Werkzeugstahl, ganz verchromt.

PEQUEÑO JUEGO DE LLAVES TUBULARES GOLA. Ejecución ligera con cuadradillo de 8 mm. Llaves tubulares de acero cromo al vanadio con aberturas dodecagonales. Chicharra y alargadores auxiliares de acero de herramientas, completamente cromadas.



Steel box dimensions / Schachtelabmessungen / dimensions de la boite / dimensiones de la caja:
Length / Länge / longueur / longitud 17 cm
width / Breite / largeur / ancho 7,8 cm
height / hauteur / Höhe / altura 3,3 cm
weight of the set / Gewicht des ganzen Satzes / poids complet du jeu / peso del juego completo } 98 dkg

The box contains / Die Schachtel enthält folgende Stücke / la boite contient / contenido de la caja:

SL 368 Ratchet / Freilaufknarre / cliquet / chicharra
Länge / longueur / longitud 160 mm
length 6"

SL 375 Sliding Tee Bar / Griff mit Gleitstück / poignée coulissante / barra corediza
Länge / longueur / longitud 150 mm
length 6"

SL 378 Long Extension-Bar / langes, festes Verlängerungsstück / rallonge raide longue / Alargador fijo largo
Länge / longueur / longitud 130 mm
length 5"

SL 379 Short Extension-Bar / kurzes, festes Verlängerungsstück / rallonge raide courte / Alargador fijo corto
Länge / longueur / longitud 65 mm
length 2 1/2"

SL 380 Tommy-Bar / Drehstift / rallonge / Alargador fijo mediano
Länge / longueur / longitud 120 mm
length 5"

Chrom-vanadium steel sockets / Steckschlüsseleinsätze aus Chrom-Vanadium-Stahl / clefs à douille en acier au chrome-vanadium / piezas adicionales de bocas sueltas de acero cromo al vanadio:

SL 383 Socket / Steckschlüsseleinsatz / clef à douille / piezas adicionales de bocas sueltas
Maulweite / ouverture / abertura 5 mm
diameter 7/32"

SL 384 Socket / Steckschlüsseleinsatz / clef à douille / piezas adicionales de bocas sueltas
Maulweite / ouverture / abertura 6 mm
diameter 1/4"

SL 385 Socket / Steckschlüsseleinsatz / clef à douille / piezas adicionales de bocas sueltas
Maulweite / ouverture / abertura 7 mm
diameter 9/32"

SL 386 Socket / Steckschlüsseleinsatz / clef à douille / piezas adicionales de bocas sueltas
Maulweite / ouverture / abertura 8 mm
diameter 5/16"

SL 387 Socket / Steckschlüsseleinsatz / clef à douille / piezas adicionales de bocas sueltas
Maulweite / ouverture / abertura 9 mm
diameter 3/8"

SL 388 Socket / Steckschlüsseleinsatz / clef à douille / piezas adicionales de bocas sueltas
Maulweite / ouverture / abertura 10 mm
diameter 12/32"

SL 389 Socket / Steckschlüsseleinsatz / clef à douille / piezas adicionales de bocas sueltas
Maulweite / ouverture / abertura 11 mm
diameter 7/16"

SL 390 Socket / Steckschlüsseleinsatz / clef à douille / piezas adicionales de bocas sueltas
Maulweite / ouverture / abertura 12 mm
diameter 1/2"

SL 391 Socket / Steckschlüsseleinsatz / clef à douille / piezas adicionales de bocas sueltas
Maulweite / ouverture / abertura 13 mm
diameter 7/32"

SL 392 Socket / Steckschlüsseleinsatz / clef à douille / piezas adicionales de bocas sueltas
Maulweite / ouverture / abertura 14 mm
diameter 9/16"

Packing: each set separately / Einzelverpackung / Emballage: per 1 pièce / Embalaje: particular

MOTOKOV · PRAHA · CZECHOSLOVAKIA

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4 A/23 0611

FORGED SPANNERS, DOUBLE ENDED, of alloy-steel, special execution; black, bright heads.

CLEFS À FOURCHES, FORGÉES, DOUBLES, en acier allié, exécution spéciale; noires, à tetes blanchies.

GESENKGESCHMIEDETE DOPPELTE GABEL-SCHRAUBENSCHLÜSSEL aus legiertem Stahl, Spezialausführung; schwarz mit blanken Köpfen.

LLAVES SPECIALES PARA TUERCAS, FORJADAS, DOBLES, de aleación de acero, negras, con cabezas bruñidas.

openings Maulweiten ouvertures aberturas		lengths Längen longueurs longitudes		thickness of heads Kopfstärken épaisseur des têtes / espesor de cabezas	width of heads Kopfbreiten largeur des têtes ancho de cabezas		weight of one spanner Gewicht poids d'une clef peso de una pieza	
s1	s2	L	l	t	b1	b2	kg	lbs
5,5 7/32"	7 9/32"	93 3 5/8"	80 3 1/8"	3,2 1/8"	15 19/32"	17 11/16"	0,017	-/ 5/8
9 3/8"	10 13/32"	110 4 11/16"	100 3 15/16"	4,5 3/16"	22 7/8"	24 15/16"	0,035	-/ 1 1/1
11 7/16"	12 15/32"	131 5 3/16"	108 4 1/4"	5 7/32"	26 1 1/32"	28 1 3/32"	0,060	-/ 2 3/8
14 9/16"	17 11/16"	156 6 3/16"	125 4 15/16"	6 1/4"	32,5 1 9/32"	39 1 17/32"	0,112	-/ 4
19 3/4"	22 7/8"	190 7 1/2"	155 5 7/8"	7 9/32"	43 1 11/16"	49,5 1 15/16"	0,208	-/ 7 1/4
24 15/16"	27 1 1/16"	239 9 3/4"	190 7 1/2"	8,5 11/32"	43 1 11/16"	53,5 2 1/8"	0,210	-/ 7 1/4
24 15/16"	30 1 3/16"	261 10 1/4"	210 8 1/4"	9 3/8"	53,5 2 1/8"	60 2 3/8"	0,350	-/12 1/4
30 1 3/16"	32 1 1/4"	288 10 9/16"	210 8 1/4"	9,5 3/8"	53,5 2 1/8"	66,5 2 5/8"	0,480	1/ 3/4
36 1 7/16"	38 1 1/2"	335 13 3/16"	265 10 7/16"	12 15/32"	79 3 1/8"	90 3 1/2"	1,100	2/6 1/2

TRADE MARK

5 A/23 0610

FORGED SPANNERS, DOUBLE ENDED, of steel, black.

CLEFS À FOURCHES, FORGÉES, DOUBLES, en acier, noires.

GESENKGESCHMIEDETE DOPPELTE GABEL-SCHRAUBENSCHLÜSSEL aus nicht legiertem Stahl, schwarz.

LLAVES PARA TUERCAS, FORJADAS, DOBLES, de acero, negras.

openings Maulweiten ouvertures aberturas		lengths Längen longueurs longitudes		thickness of heads Kopfstärken épaisseur des têtes / espesor de cabezas	width of heads Kopfbreiten largeur des têtes ancho de cabezas		weight of one spanner Gewicht eines Schlüssels poids d'une clef peso de una pieza	
s1	s2	L	l	t	b1	b2	kg	lbs
5,5 7/32"	7 9/32"	93 3 5/8"	80 3 1/8"	3,2 1/8"	15 19/32"	17 11/16"	0,017	/ 5/8
9 3/8"	10 13/32"	110 4 3/4"	100 3 15/16"	4,5 3/16"	22 7/8"	24 15/16"	0,035	/ 1 1/4
11 7/16"	12 15/32"	131 5 3/16"	108 4 1/4"	5 7/32"	26 1 1/32"	28 1 3/32"	0,060	/ 2 3/8
14 9/16"	17 11/16"	156 6 3/16"	125 4 15/16"	6 1/4"	32,5 1 9/32"	39 1 17/32"	0,112	/ 4
19 3/4"	22 7/8"	190 7 1/2"	155 5 7/8"	8 5/16"	43 1 11/16"	49,5 1 15/16"	0,208	/ 7 1/4
24 15/16"	27 1 1/16"	239 9 3/8"	190 7 1/2"	9 3/8"	43 1 11/16"	53,5 2 1/8"	0,210	/ 7 1/4
24 15/16"	30 1 3/16"	261 10 1/4"	210 8 1/4"	10 13/32"	53,5 2 1/8"	60 2 3/8"	0,350	/12 1/4
30 1 3/16"	32 1 1/4"	268 10 9/16"	210 8 1/4"	12 15/32"	66,5 2 5/8"	70,5 2 3/4"	0,480	1/ 3/4
36 1 7/16"	41 1 5/8"	337 13 1/4"	265 10 7/16"	14 9/16"	79 3 1/8"	90 3 1/2"	0,600	1/ 5
46 1 13/16"	50 2"	409 16 1/8"	320 12 5/8"	16 5/8"	100 4"	100 4 5/16"	1,08	2/ 5 3/4
55 2 3/16"	60 2 3/8"	486 19 1/8"	380 15"	18 11/16"	120 4 3/4"	100 4 5/16"	1,84	4/ 4
65 2 9/16"	70 2 3/4"	565 22 1/4"	440 17 5/16"	20 25/32"	140 5 1/2"	130 5 1/8"	2,88	6/ 5
75 3"	80 3 1/8"	645 25 3/8"	500 19 11/16"	22 7/8"	160 6 5/16"	150 5 7/8"	4,5	10/ -
						170 6 11/16"	6,5	14/ 3

TRADE MARK

6 A

FORGED SPANNERS, SINGLE ENDED, of alloy-steel, special execution; black, bright heads.

CLEFS À FOURCHES, FORGÉES, SIMPLES, en acier allié, exécution spéciale, noires, à têtes blanchies.

GESENKGESCHMIEDETE EINFACHE GABEL-SCHRAUBENSCHLÜSSEL aus legiertem Stahl, Spezialausführung; schwarz mit blanken Köpfen.

LLAVES SPECIALES PARA TUERCAS, FORJADAS, SENCILLAS, de aleación de acero, negras, con cabezas bruñidas.

opening Maulweite ouverture abertura	lengths Längen longueurs longitudes		thickness of head Kopfstärke épaisseur de la tête espesor de cabeza	width of head Kopfbreite largeur de la tête ancho de cabeza	weight of 1 spanner Gewicht eines Schlüssels poids d'une clef peso de una pieza	
s	L	l	t	b	kg	lbs
5,5 7/32"	71 2 13/16"	65 2 9/16"	3,2 1/8"	15 19/32"	0,012	-/ 7/16
6 1/4"	71 2 13/16"	65 2 9/16"	3,2 1/8"	15 19/32"	0,011	-/ 3/8
7 9/32"	77 3"	70 2 3/4"	3,2 1/8"	17 11/16"	0,014	-/ 1/2
8 5/16"	93 3 5/8"	85 3 3/8"	3,2 1/8"	20 25/32"	0,022	-/ 3/4
9 3/8"	99 3 7/8"	90 3 1/2"	4 5/32"	22 7/8"	0,030	-/ 1 1/16
10 13/32"	105 4 1/8"	95 3 3/4"	4,5 3/16"	24 15/16"	0,048	-/ 1 11/16
11 7/16"	111 4 3/8"	100 4"	5 7/32"	26 1 1/32"	0,048	-/ 1 11/16
12 15/32"	124 4 7/8"	112 4 3/8"	5 7/32"	28 1 3/32"	0,050	-/ 1 3/4
14 9/16"	139 5 1/2"	125 4 15/16"	5,5 7/32"	32,5 1 9/32"	0,063	-/ 2 3/16
17 11/16"	157 6 3/16"	140 5 1/2"	6 1/4"	39 1 17/32"	0,098	-/ 3 7/16
19 3/4"	169 6 5/8"	150 5 7/8"	7 9/32"	43 1 11/8"	0,120	-/ 4 3/16
22 7/8"	191,5 7 1/2"	170 6 11/16"	7 9/32"	49,5 1 15/16"	0,180	-/ 6 5/16
24 15/16"	213 8 3/8"	190 7 1/2"	8,5 11/32"	53,5 2 1/8"	0,200	-/ 7
27 1 1/16"	236 9 1/4"	210 8 1/4"	9 3/8"	60 2 3/8"	0,260	-/ 9 7/16
30 1 3/16"	258,5 10 1/8"	230 9 1/16"	10 13/32"	66,5 2 5/8"	0,350	-/10 1/2
32 1 1/4"	270 10 5/8"	240 9 1/2"	10,5 13/32"	70,5 2 3/4"	0,496	1/ 1 1/2
36 1 7/16"	299 11 3/4"	265 10 7/16"	11 7/16"	79 3 1/8"	0,624	1/ 5 7/8
38 1 1/2"	336 13 1/4"	300 11 13/16"	12 15/32"	90 3 1/2"	0,870	1/14 1/2

7 A/236

FORGED SPANNERS, SINGLE ENDED, of steel, black.

CLEFS À FOURCHES, FORGÉES, SIMPLES, en acier, noires.

GESENKGESCHMIEDETE EINFACHE GABEL-SCHRAUBENSCHLÜSSEL aus nicht legiertem Stahl, schwarz.

LLAVES PARA TUERCAS, FORJADAS, SENCILLAS, de acero, negras.

opening Maulweite ouverture abertura	lengths Längen longueurs longitudes		thickness of head Kopfstärke épaisseur de la tête espesor de cabeza	width of head Kopfbreite largeur de la tête ancho de cabeza	weight of 1 spanner Gewicht eines Schlüssels poids d'une clef peso de una pieza	
s	L	l	t	b	kg	lbs
5,5 7/32"	71 2 13/16"	65 2 9/16"	3,2 1/8"	15 19/32"	0,012	/ 7/16
6 1/4"	71 2 13/16"	65 2 9/16"	3,2 1/8"	15 19/32"	0,011	/ 3/8
7 9/32"	77 3"	70 2 3/4"	3,2 1/8"	17 11/16"	0,014	/ 1/2
8 5/16"	93 3 5/8"	85 3 3/8"	3,5 1/8"	20 25/32"	0,022	-/ 3/4
9 3/8"	99 3 7/8"	90 3 1/2"	4 5/32"	22 7/8"	0,030	-/ 1 1/16
10 13/32"	105 4 1/8"	95 3 3/4"	4,5 3/16"	24 15/16"	0,048	-/ 1 11/16
11 7/16"	111 4 3/8"	100 4"	5 7/32"	26 1 1/32"	0,048	-/ 1 11/16
12 15/32"	124 4 7/8"	112 4 3/8"	5 7/32"	28 1 3/32"	0,050	-/ 1 3/4
14 9/16"	139 5 1/2"	125 4 15/16"	5,5 7/32"	32,5 1 9/32"	0,063	-/ 2 3/16
17 11/16"	157 6 3/16"	140 5 1/2"	6 1/4"	39 1 17/32"	0,098	-/ 3 7/16
19 3/4"	169 6 5/8"	150 5 7/8"	7 9/32"	43 1 11/8"	0,120	-/ 4 3/16
22 7/8"	191,5 7 1/2"	170 6 11/16"	8 5/16"	49,5 1 15/16"	0,180	-/ 6 5/16
24 15/16"	213 8 3/8"	190 7 1/2"	9 3/8"	53,5 2 1/8"	0,200	-/ 7
27 1 1/16"	236 9 1/4"	210 8 1/4"	10 13/32"	60 2 3/8"	0,260	-/ 9 7/16
30 1 3/16"	258,5 10 1/8"	230 9 1/16"	10 13/32"	66,5 2 5/8"	0,350	-/10 1/2
32 1 1/4"	270 10 5/8"	240 9 1/2"	10,5 13/32"	70,5 2 3/4"	0,496	1/ 1 1/2
36 1 7/16"	299 11 3/4"	265 10 7/16"	11 7/16"	79 3 1/8"	0,624	1/ 5 7/8
41 1 5/8"	338 13 3/8"	300 11 13/16"	14 9/16"	90 3 1/2"	0,84	1/13 5/8
46 1 13/16"	373 14 3/4"	330 13"	15 19/32"	100 4"	1,32	2/14 1/2
50 2"	406 16"	360 14 3/16"	16 5/8"	109 4 1/4"	1,60	3/ 8 3/4
55 2 3/16"	451 17 3/4"	400 15 3/4"	17 11/16"	120 4 3/4"	2,22	4/14 1/8
60 2 3/8"	485 19 1/8"	430 16 15/16"	18 23/32"	130 5 1/8"	2,56	5/10 1/8
65 2 9/16"	520 20 1/2"	460 18 1/8"	19 3/4"	140 5 1/2"	3,20	7/ 6 3/8
70 2 3/4"	565 22 1/4"	500 19 11/16"	20 25/32"	150 5 7/8"	3,60	7/14 3/4
75 3"	600 23 5/8"	530 20 7/8"	21 13/16"	160 6 5/16"	4,33	9/ 8 3/8
80 3 1/8"	635 25"	560 21 1/16"	22 7/8"	170 6 11/16"	5,44	12/

TRADE MARK

...DICKOV ...ČR... CZECHOSLOVAKIA

A

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8 A

FORGED RING WRENCHES, made of alloy-steel, both ends bent, with 12 notches inside. Chromium-plated, with polished heads; or of gun metal with bright heads.

CLEFS À ANNEAUX, FORGÉES, en acier allié, les deux bouts coudés, à 12 encoches en dedans; chromées-têtes polies ou brunies têtes polies.

GESENKGESCHMIEDETE ZWÖLFKANT-RING-STECKSCHLÜSSEL, doppelt verkröpft, aus legiertem Stahl. Verchromt, mit polierten Köpfen oder brüniert mit blanken Köpfen.

LLAVES DE ANILLO, FORJADAS, de alención de acero, ambas bocas dobladas, con 12 entalladuras por dentro. Cromadas con cabezas pulidas o oxidadas con cabezas pulidas.

Order No Bestell-nummer No de comm. mande Número de la orden	opening Maulweite ouverture abertura		length Länge longueur longitud		thickness of notches Ringstärke épaisseur des encoches espesor de entalladuras		weight Gewicht poids peso	
	mm	inches	mm	inches	mm	inches	kg	lbs
OV 104	5 × 6	7/32 × 1/4	145	5 3/4	4 × 5	3/16 × 7/32	0,040	–/ 1 7/16
OV 105	7 × 8	9/32 × 5/16	160	6 3/8	5 × 6	7/32 × 1/4	0,050	–/ 1 3/4
OV 106	9 × 11	3/8 × 7/16	185	7 1/4	6 × 8	1/4 × 5/16	0,080	–/ 2 7/8
OV 107	10 × 12	13/32 × 1/2	200	7 7/8	8 × 9	5/16 × 3/8	0,090	–/ 3 1/8
OV 108	13 × 14	17/32 × 9/16	215	8 1/2	10 × 11	13/32 × 7/16	0,140	–/ 5
OV 109	15 × 17	19/32 × 11/16	235	9 1/4	11 × 12	7/16 × 1/2	0,180	–/ 6 3/8
OV 110	16 × 18	5/8 × 23/32	250	9 7/8	12 × 13	1/2 × 17/32	0,210	–/ 7 7/16
OV 111	19 × 20	3/4 × 25/32	270	10 5/8	14 × 15	9/16 × 19/32	0,290	–/10 1/4
OV 112	21 × 22	13/16 × 7/8	200	11 1/2	16 × 17	5/8 × 11/16	0,360	–/12 3/4
OV 113	23 × 24	15/16 × 31/32	315	12 1/2	17 × 18	11/16 × 23/32	0,470	1/ 1/2
OV 114	25 × 26	1 × 1 1/32	340	13 3/8	19 × 20	3/4 × 25/32	0,550	1/ 3 3/8
OV 115	27 × 28	1 1/16 × 1 1/8	360	14 1/4	20 × 21	25/32 × 13/16	0,700	1/ 8 3/4
OV 116	29 × 30	1 5/32 × 1 3/16	385	15 1/8	22 × 23	7/8 × 15/16	0,850	1/14
OV 117	31 × 32	1 7/32 × 1 1/4	425	16 3/4	24 × 24	31/32 × 31/32	0,960	2/ 1 3/4
OV 118	33 × 37	1 5/16 × 1 15/32	450	17 3/4	25 × 28	1 × 1 1/8	1,100	2/ 3 7/8
OV 119	34 × 38	1 11/32 × 1 1/2	480	18 7/8	26 × 29	1 1/32 × 1 5/32	1,550	3/ 6 1/2
OV 120	35 × 40	1 3/8 × 1 9/16	500	19 3/4	27 × 30	1 1/16 × 1 3/16	1,700	3/11 7/8
OV 121	36 × 41	1 7/16 × 1 5/8	525	20 5/8	28 × 30	1 1/8 × 1 3/16	1,870	4/1 7/8

9 A

COMBINATION SINGLE- AND RING-END SPANNER in flat execution, forged, of alloy-steel; on one end provided with a dodecagonal notch, the other end open. Black finish with bright heads.

CLEFS PLATES DOUBLES À FOURCHES ET À ANNEAUX, forgées. en acier allié. Un bout à 12 encoches en dedans, l'autre bout ouvert. Noires, têtes polies.

GABEL-RINGSCHLÜSSEL in flacher Ausführung, geschmiedet, aus legiertem Stahl. An einem Ende mit Zwölfkantring, an dem anderen Ende offen. Schwarz mit blanken Köpfen.

LLAVES DOBLES, COMBINADAS DE HORQUILLA Y ANILLO, forjadas, de alención de acero, con 12 entalladuras — otro extremo abierto. Negras, con cabezas pulidas.

openings Maulweiten ouvertures aberturas		lengths Längen longueurs longitudes		head Kopf tête cabeza		notches Ring encoches entalladuras		weight of one wrench Gewicht poids d'une clef peso de una pieza	
s1	s2	L	l	t	b	h	d	kg	lbs
11 7/16"	11 7/16"	180 6 3/16"	140 5 1/2"	5 7/32"	26 1 1/32"	16 5/8"	18 23/32"	0,075	–/2 3/8
12 15/32"	12 15/32"	170 6 3/4"	146 5 3/4"	5 7/32"	28 1 3/32"	18 23/32"	20 25/32"	0,090	–/2 1/8
14 9/16"	14 9/16"	180 7 1/8"	150 5 7/8"	5,5 7/32"	32,5 1 9/32"	20 25/32"	22 7/8"	0,140	–/3
17 11/16"	17 11/16"	200 7 7/8"	170 6 3/4"	6 1/4"	39 1 17/32"	22 7/8"	26 1 1/32"	0,240	–/5 1/2
19 3/4"	19 3/4"	220 8 5/8"	185 7 1/4"	7 9/32"	43 1 11/16"	23 1"	28 1 1/32"	0,320	–/11 1/4
22 7/8"	22 7/8"	250 9 7/8"	210 8 1/4"	7 9/32"	49,5 1 13/16"	28 1 3/32"	34 1 3/8"	0,450	1/-
24 15/16"	24 15/16"	280 11"	235 9 1/4"	8,5 3/16"	53,5 2 1/8"	32 1 1/4"	36 1 7/16"	0,490	1/1 1/4
27 1 1/16"	27 1 1/16"	300 11 7/8"	250 9 7/8"	9 3/8"	60 2 3/8"	36 1 7/16"	40 1 9/16"	0,570	1/4
30 1 3/16"	30 1 3/16"	315 12 3/8"	260 10 1/4"	10 13/32"	66,5 2 5/8"	38 1 1/2"	45 1 3/4"	0,760	1/10 3/1
32 1 1/4"	32 1 1/4"	330 13"	273 10 3/4"	10,5 13/32"	70,5 2 3/4"	42 1 5/8"	48 1 7/8"	0,850	1/14

9 A/OP

COMBINATION SINGLE- AND RING-END SPANNER in flat execution, forged, of alloy-steel; on one end provided with a dodecagonal notch, the other end open. Chromium-plated, polished heads.

CLEFS PLATES DOUBLES À FOURCHES ET À ANNEAUX, forgées, en acier allié. Un bout à 12 encoches en dedans, l'autre bout ouvert. Chromées, à têtes polies.

GABEL-RINGSCHLÜSSEL in flacher Ausführung, geschmiedet, aus legiertem Stahl. An einem Ende mit Zwölfkantring, an dem anderen Ende offen. Verchromt mit polierten Köpfen.

LLAVES DOBLES, COMBINADAS DE HORQUILLA Y ANILLO, forjadas, de alención de acero, con 12 entalladuras — otro extremo abierto. Cromadas, con cabezas pulidas.

Order No Bestell-Nr. No de comm. Nº de la orden	opening Maulweite ouverture abertura		length Länge longueur longitud		thickness of heads Kopfstärke épaisseur des têtes espesor de cabezas		notches Ring encoches entalladuras		weight Gewicht poids peso	
	mm	inches	mm	inches	mm	inches	mm	inches	g	ozs
OP 65	4	3/16	100	4	2	5/64	8	5/16	20	3/4
OP 66	5	7/32	105	4 1/4			9	3/8	25	7/8
OP 67	6	1/4	115	4 1/2	2,5	3/32	10	13/32	30	1
OP 68	7	9/32	120	4 3/4			12	15/32	35	1 1/4
OP 69	8	5/16	130	5	3	1/8	13	1/2	45	1 5/8
OP 70	9	3/8	135	5 1/2			14	9/16	55	2
OP 71	10	13/32	145	5 3/4			16	5/8	65	2 1/4
OP 72	11	7/16	150	6	4	3/16	17	11/16	75	2 5/8
OP 73	12	1/2	160	6 3/8			19	3/4	90	3 1/8
OP 74	13	17/32	165	6 5/8			20	25/32	110	3 7/8
OP 75	14	9/16	175	6 7/8			22	7/8	140	5
OP 76	15	19/32	185	7 1/4	5	7/32	23	29/32	170	6
OP 77	16	5/8	195	7 5/8			25	1"	210	7 7/16
OP 78	17	11/16	200	7 7/8			26	1 1/32	240	8 1/2
OP 79	18	23/32	210	8 1/4			28	1 3/32	290	10 1/4
OP 80	19	3/4	215	8 1/2			29	1 1/8	320	12 3/8
OP 81	20	25/32	225	8 7/8	6	1/4	31	1 7/32	360	12 3/4
OP 82	21	13/16	235	9 1/4			32	1 1/4	400	14 1/8
OP 83	22	7/8	245	9 5/8			34	1 3/8	450	15 7/8
OP 84	23	15/16	250	9 7/8	7	9/32	36	1 7/16	470	16 9/16
OP 85	24	31/32	260	10 1/4			38	1 1/2	490	17 1/4
OP 86	25	1	270	10 5/8			40	1 9/16	510	18
OP 87	26	1 1/32	280	11			42	1 5/8	540	19
OP 88	27	1 1/16	290	11 1/2	8	5/16	44	1 3/4	570	20 1/8
OP 89	28	1 1/8	300	11 7/8			46	1 11/16	620	21 7/8
OP 90	29	1 5/32	310	12			48	1 7/8	680	24
OP 91	30	1 3/16	315	12 3/8	9	3/8	51	2	760	26 3/4
OP 92	32	1 1/4	330	13			54	2 1/8	850	30

Sets / Jeux / Sätze / Juegos

Order No SOP I	Order No SOP II	Order No SOP III	Order No SOP IV
Bestellnummer No de commande Número de la orden	Bestellnummer No de commando Número de la orden	Bestellnummer No de commando Número de la orden	BestelNummer No de commando Número de la orden
mm / inches	mm / inches	mm / inches	mm / inches
4 3/16			
5 7/32			
6 1/4			
7 9/32	7 9/32		
8 5/16	8 5/16	8 5/16	
9 3/8	9 3/8	9 3/8	9 3/8
10 13/32	10 13/32	10 13/32	10 13/32
11 7/16	11 7/16	11 7/16	11 7/16
12 1/2	12 1/2	12 1/2	12 1/2
13 17/32	13 17/32	13 17/32	13 17/32
14 9/16	14 9/16	14 9/16	14 9/16
15 19/32	15 19/32	15 19/32	15 19/32
16 5/8	16 5/8	16 5/8	16 5/8
17 11/16	17 11/16	17 11/16	17 11/16
	18 23/32	18 23/32	18 23/32
	19 3/4	19 3/4	19 3/4
	20 25/32	20 25/32	20 25/32
	21 13/16	21 13/16	21 13/16
	22 7/8	22 7/8	22 7/8
		23 15/16	23 15/16
		24 31/32	24 31/32
		25 1	25 1
		26 1 1/32	26 1 1/32
		27 1 1/16	27 1 1/16
		28 1 1/8	28 1 1/8
			29 1 5/32
			30 1 3/16
			32 1 1/4

MOTOKOV PRAHA · CZECHOSLOVAKIA

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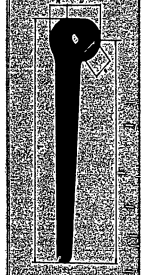


10 A

SQUARE TUBULAR BOX SPANNERS, forged, black japanned.

CLEFS À DOUILLES CARRÉES, forgées, vernies noir.

VIERKANT-STECKSCHLÜSSEL, geschmiedet, schwarz lackiert.

LLAVES TUBULARES CUADRADAS, forjadas, barnizadas en negro.

opening square Maulweite Vierkant ouverture carrée abertura cuadrada	lengths Längen longueurs longitudes		Head Kopf tête cabeza		weight of one spanner Gewicht eines Schlüssels poids d'une clef peso de una pieza	
a	L	l	D	h	kg	lbs
5 7/32"	97 3 7/8"	90 3 5/8"	11 7/16"	10 3/8"	0,025	–/ 7/8
6 1/4"	107 4 1/4"	100 4"	12 15/32"	10 3/8"	0,030	–/ 1 1/16
7 9/32"	118,5 4 5/8"	110 4 5/16"	14 9/16"	12 15/32"	0,038	–/ 1 3/8
8 5/16"	130 5 1/8"	120 4 3/4"	16 5/8"	15 19/32"	0,050	–/ 1 3/4
9 3/8"	141 5 9/16"	130 5 1/8"	18 23/32"	17 11/16"	0,070	–/ 2 1/2
10 13/32"	152 6"	140 5 1/2"	20 25/32"	18 23/32"	0,080	–/ 2 7/8
11 7/16"	163 6 7/16"					
12 15/32"	163 6 7/16"	150 5 7/8"	22 7/8"	20 25/32"	0,10	–/ 3 1/2
14 9/16"	185,5 7 5/16"	170 6 11/16"	26 1 1/32"	27 1 1/16"	0,14	–/ 5
17 11/16"	229 9"	210 8 1/4"	32 1 1/4"	28 1 3/32"	0,26	–/ 9 1/8
19 3/4"	251 9 7/8"	230 9 1/16"	35 1 3/8"	32 1 1/4"	0,38	–/13 3/8
22 7/8"	276 10 13/16"	250 9 7/8"	40 1 9/16"	38 1 1/2"	0,50	1/ 1 5/8
24 15/16"	366 14 3/8"	280 11"	45 1 3/4"	40 1 9/16"	0,80	1/ 5 1/8
27 1 1/16"	327 12 7/8"	300 11 13/16"	48 1 7/8"	45 1 3/4"	0,80	1/12 1/8
30 1 3/16"	348 13 11/16"	320 12 5/8"	52 2 1/16"	50 2"	1,—	2/ 3 1/4
32 1 1/4"	383 15 1/8"	350 13 3/4"	58 2 1/4"	54 2 1/8"	1,30	2/13 3/4
36 1 7/16"	416 16 3/8"	380 15"	64 2 1/2"	62 2 7/16"	1,70	3/11 7/8
41 1 5/8"	439 17 1/4"	400 15 3/4"	70 2 3/4"	68 2 11/16"	2,20	4/13 3/8
46 1 13/16"	514 20 1/4"	430 16 15/16"	76 3"	74 2 15/16"	2,70	5/15
50 2"	542 21 3/8"	450 17 3/4"	84 3 5/16"	78 3 1/16"	3,5	7/11 1/4

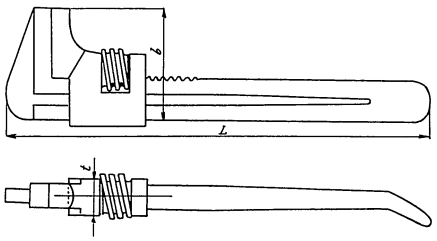
11 A/224

ADJUSTABLE WRENCHES FOR MOTOR-CARS AND BICYCLES TYPE STERLING. The body of high quality steel, the adjustable jaw with screw-nut of forged malleable cast-iron. Black japanned.

CLEFS À ECROUS POUR AUTOMOBILES ET BICYCLETTES MODÈLE STERLING. Corps en acier de bonne qualité, mâchoire à coulisse avec molette en fonte malléable forgée. Vernies noir.

SCHRAUBENSCHLÜSSEL FÜR AUTOMOBILE UND FAHRRÄDER STERLING. Körper aus Qualitätsstahl, geschmiedete verstellbare Backe mit Schraubnuß aus Tempérguß. Schwarz lackiert.

LLAVES PARA TUERCAS, MODELOS ESPECIALES PARA AUTOMOBILES Y BICICLETAS STERLING. Cuerpo de la llave de acero de calidad. Moradas movibles, moleta, de fundición templada, forjadas. Charoladas negras.



grandeur Größe size tamaño	L	b	t	poids d'une clef Gewicht eines Schlüssels peso de una pieza	weight of one wrench
100 mm 7 1/2"	100 mm 7 1/2"	40 mm 1 1/2"	14 mm 7/16"	0,188 kg	–/ 6 9/16 lbs
240 mm 7 1/2"	240 mm 9 1/2"	69,5 mm 2 3/8"	17 mm 11/16"	0,438 kg	–/15 3/8 lbs

12 A/217

CLYBURN SPANNERS BAHCO, forged steel, black japanned, polished head.

CLEFS À ÉCROUS À MOLETTE BAHCO, forgées, vernies noir, tête polie.

ROLLGABELSCHLÜSSEL BAHCO, geschmiedet, schwarz lackiert, mit poliertem Kopf.

LLAVES PARA TUERCAS CON MOLETA BAHCO, forjadas, charoladas negras con cabezas pulidas.

TRADE MARK

Länge / longueur / longitud length	200 mm 8 mm
Gewicht / poids / peso weight	0,30 kg —/10 1/2 lbs

13 A/208

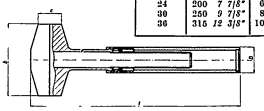
DOUBLE ENDED HEAD WRENCHES, all of forged steel, with polished head and chequered handle.

CLEFS À ECROUS, À DOUBLE TÊTE, entierement en acier forgé, têtes polies, tiges quadrillées.

DOPPELTE STAHLSCHRAUBENSCHLÜSSEL, ganz aus Stahl geschmiedet, mit poliertem Kopf und geränderltem Handgriff.

LLAVES PARA TUERCAS DOBLES, entramente en acero forjado, con cabezas pulidas y mangos estriados.

TRADE MARK



size Größe largeur tamaño	l	b	c	D	Gewicht poids peso kg	weight lbs
17	160 6 1/4"	48 1 7/8"	16 5/8"	18 11/16"	0,22	–/7 3/4
24	200 7 7/8"	68 2 5/8"	22 7/8"	24 15/16"	0,48	1/ 1/8
30	250 9 7/8"	85 3 3/8"	28 1 1/8"	28 1 1/8"	1,20	2/10
36	315 12 3/8"	105 4 1/8"	34 1 3/8"	35 1 3/8"	2,20	4/13 3/8

14 A

TUBULAR BOX SPANNERS, HEXAGONAL, made of hexagonal seamless steel tubes. Sand blasted, phosphated or japanned. For tightening of hexagonal nuts.

CLEFS À DOUILLES HEXAGONALES, fabriquées de tubes hexagonales étirées en acier. Le finissage de la surface est fait par sablage, phosphatage ou vernissage. Pour serrage des écrous à 6 pans.

SECHSKANTIGE STECKSCHLÜSSEL aus sechskantigen gezogenen Stahlrohren. Gesandet, phosphatiert oder lackiert. Zum Anziehen von Sechskantmuttern.

LLAVES TUBULARES EXÁGONALES de tubos exágonales tirados de acero. Superficio arenizada, fosfatizada o barnizada. Para sujetar tuercas exágonales.

opening Muttergröße ouverture abertura					weight of one spanner Gewicht eines Schlüssels poids d'une clef peso de una pieza	
S B 12	L	L1	D	t	kg	lbs
9 3/8"	70 2 3/4"	6 1/4"	4,5 3/16"	1,2 1/16"	0,024	–/ 7/8
10 13/32"	80 3 1/8"	8 5/16"	5,5 7/32"	1,3 1/16"	0,032	–/ 1 1/8
11 7/16"	80 3 1/8"	8 5/16"	6,5 1/4"	1,3 1/16"	0,035	–/ 1 1/4
14 9/16"	80 3 1/8"	8 5/16"	6,5 1/4"	1,5 1/16"	0,051	–/ 1 3/4
17 11/16"	90 3 5/8"	10 3/8"	8,5 11/32"	1,6 1/16"	0,073	–/ 2 7/16
19 3/4"	90 3 5/8"	10 3/8"	10,5 13/32"	1,7 1/16"	0,087	–/ 3 1/16
22 7/8"	90 3 5/8"	10 3/8"	10,5 13/32"	1,8 1/16"	0,104	–/ 3 5/8
24 15/16"	100 4"	12 1/2"	12,5 1/2"	1,8 1/16"	0,119	–/ 4 3/16
27 1 1/16"	100 4"	12 1/2"	12,5 1/2"	2 3/32"	0,166	–/ 5 1/2
30 1 3/16"	110 4 5/16"	16 5/8"	16,5 21/32"	2,2 3/32"	0,208	–/ 7 1/4
32 1 1/4"	110 4 5/16"	16 5/8"	16,5 21/32"	2,2 3/32"	0,221	–/ 7 3/4
36 1 7/16"	125 4 15/16"	20 3/4"	20,5 13/16"	2,5 3/32"	0,318	–/11 1/8
41 1 5/8"	125 4 15/16"	20 3/4"	20,5 13/16"	3 1/8"	0,437	–/15 5/16
46 1 7/8"	140 5 1/2"	20 3/4"	20,5 13/16"	3 1/8"	0,548	1/ 3 1/4
50 2"	140 5 1/2"	20 3/4"	20,5 13/16"	4 5/32"	0,802	1/12 7/8
55 2 3/16"	160 6 5/16"	25 1"	26,1 1/32"	4 5/32"	0,989	2/2 7/8
60 2 3/8"	160 6 5/16"	25 1"	26 1 1/32"	4 5/32"	1,08	2/9 7/8
65 2 9/16"	180 7 1/8"	25 1"	26 1 1/32"	4,5 3/16"	1,50	3/4 7/8

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35 A

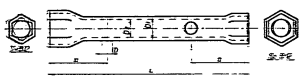
TUBULAR BOX SPANNERS, DOUBLE ENDED, made of high quality steel, sand blasted, ghosphated of jasmed surface finish. For tightening of hexagonal nuts.

CLEFS À DOUILLES, DOUBLES, en acier de bonne qualité, finissage de la surface par sablage, phosphatage ou vernissage. Pour serrage des écrous à 6 pans.

DOPPELTE STECKSCHLÜSSEL aus Qualitätsstahl. Oberflächenbehandlung: gesandet, phosphatiert oder lackiert. Zum Anziehen von Sechskantmuttern.

LLAVES TUBULARES DOBLES, de acero de calidad. Superficie arenizada, fosfatizada o barnizada. Para fijar tuercas exágonales.

openings / Maulweiten / ouvertures / aberturas														weight of one spanner Gewicht eines Schlüssels poids d'une clé peso de una pieza	
s1		s2		a		D1		D2		D		L		kg	lbs
9	3/8"	10	3/8"	20	3/4"	14	9/16"	10	3/8"	5,5	7/32"	90	3 5/8"	0,052	—/1 7/8
11	7/16"	12	1/2"	25	1"	16	5/8"	12	1/2"	6,5	1/4"	100	4"	0,070	—/2 1/2
12	9/16"	13	11/16"	20	1 3/16"	20	3/4"	15	5/8"	8,5	11/32"	110	4 5/16"	0,210	—/4 7/16
19	3/4"	22	7/8"	25	1 3/8"	25	1"	20	3/4"	10,5	13/32"	125	4 15/16"	0,170	—/6
24	15/16"	27	1 1/16"	40	1 7/16"	30	1 3/16"	24	15/16"	12,5	7/8"	140	5 1/2"	0,230	—/9 13/16
30	1 3/16"	32	1 1/4"	50	2"	35	1 3/8"	29	1 1/8"	16,5	21/32"	160	6 5/16"	0,280	—/13 5/16
36	1 7/16"	41	1 5/8"	55	2 3/16"	44,5	1 3/4"	35,5	1 1/2"	20,5	13/16"	180	7 1/8"	0,550	1,2 1/4
46	1 13/16"	50	2"	80	3 1/8"	57	2 1/4"	49	2"	20,5	13/16"	220	8 5/8"	1,15	2,5 1/2
55	2 3/16"	60	2 3/8"	70	2 3/4"	63,5	2 1/2"	55,5	2 3/16"	26	1 1/32"	250	9 7/8"	1,50	3,1 7/8
65	2 9/16"	70	2 3/4"	80	3 1/8"	76	3"	67	2 5/8"	26	1 1/32"	280	11"	2,20	4,12 3/8
75	3"	80	3 1/8"	90	3 5/8"	89	3 1/2"	80	3 1/8"	26	1 1/32"	315	12 3/8"	3,—	6,9 5/8



36 A

HEXAGON SOCKET SCREW WRENCH IMBUS, for socket head cap screws and hollow set screws. Made of galvanized steel.

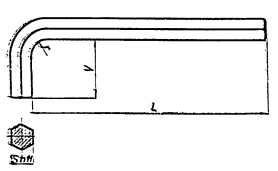
CLEFS MÂLES COUDÉES, pour vis à 6 pans creux et goujons filetés à hexagone intérieur IMBUS, en acier galvanisé.

IMBUS SECHSKANT-STIFTSCHLÜSSEL für Innensechskantschrauben und Gewindestifte. Aus verzinktem Stahl.

LLAVES DE ENCHUFE EXÁGONALES IMBUS para tuercas, exágonales interiores y tornillos de exágono interior, de acero galvanizado.

Schlüsselweite / pour ouverture en / para abertura de / for openings of	2,5	3	4	5	6	8	10	12	14	17	19	22	mm
	3/32	1/8	5/32	3/16	1/4	5/16	3/8	1/2	9/16	11/16	3/4	7/8	inches

Gewicht / poids / peso / weight	4	5	11	19	30	60	105	120	266	444	620	915	g
	1/8	3/16	3/8	11/16	1 1/16	2 1/8	3 11/16	4 1/4	9 3/16	15 9/16	21 7/8	32	ozs



SCREWDRIVERS · SCHRAUBENZIEHER · TOURNEVIS · DESTORNILLADORES

26 A/370

MARS SCREWDRIVER. The blade of high quality polished steel, rammed into the handle and riveted.

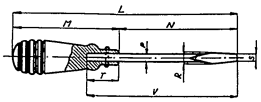
TOURNEVIS MARS. Lame en acier de bonne qualité, poli, enfoncée dans la manche et rivetée.

SCHRAUBENZIEHER MARS. Klinge aus Qualitätsstahl, poliert, im Heft eingesetzt und verniotet.

DESTORNILLADOR MARS. Hoja de acero de calidad, pulida, encajada en el mango y remachada.

Dimensions / Abmessungen / Dimensions / Dimensión

Size No Größe Nr. Grandeur No Tamaño No	L	M	N	P	R	S	T	V	weight/pe Gewicht/St. poids/pe peso/pieza kg	ozs
1	200 8"	128 5"	72 2 7/8"	8,5 7/32"	7 9/32"	6/0,8 1/4" 11/32"	40 1 9/16"	112 4 1/2"	0,080	2 1/8
2	225 9"	128 5"	97 3 7/8"	9 1/4"	8,5 11/32"	7/0,8 9/32"11/32"	40 1 9/16"	137 5 3/8"	0,090	2 3/4
3	250 10"	135 5 3/8"	115 4 1/2"	7 9/32"	9,5 3/8"	8/1 5/16"11/32"	40 1 9/16"	155 6 1/8"	0,100	3 1/2
4	275 11"	145 5 3/4"	130 5 1/8"	7 9/32"	11 7/16"	9/1 3/8" 11/32"	40 1 9/16"	170 6 5/8"	0,120	4 1/2
5	300 12"	145 5 3/4"	135 5 3/8"	8 5/16"	13 1/2"	10/1,2 3/8" 11/16"	40 1 9/16"	195 7 3/4"	0,140	5
6	315 12 1/2"	145 5 3/4"	170 6 3/4"	9 5/8"	15 19/32"	12/1,6 15/32"11/16"	40 1 9/16"	210 8 1/4"	0,160	6 1/4



27 A/700

YORK SCREWDRIVER. The blade is made of high quality polished steel, rammed into wooden handle and riveted.

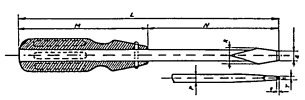
TOURNEVIS YORK, lame en acier de bonne qualité, poli, enfoncée dans une manche en bois et rivetée.

SCHRAUBENZIEHER YORK. Klinge aus Qualitätsstahl, poliert, im Holzgriff eingesetzt und verniotet.

DESTORNILLADOR YORK, hoja de acero de calidad, pulida, encajada en el mango de madera y remachada.

Dimensions / Abmessungen / Dimensions / Dimensión

Size No Größe Nr. Grandeur No Tamaño No	L	M	N	P	R	S	T	V	weight/pe Gewicht/St. poids/pe peso/pieza kg	ozs
1	175 7"	95 3 3/4"	80 3 1/8"	6 1/4"	9,5 3/8"	5,5 7/32"	0,8 1/32"	2 1/16"	0,005	2 1/4
2	210 8 1/4"	105 4 1/8"	105 4 1/8"	7 9/32"	10 13/32"	6 1/4"	0,8 1/32"	2 1/16"	0,100	3 1/2
3	240 9 1/2"	120 4 3/4"	120 4 3/4"	8 5/16"	11 7/16"	7 9/32"	1 1/32"	2,2 3/32"	0,135	4 7/8
4	280 11"	120 4 3/4"	160 6 3/8"	8 5/16"	11,5 7/16"	8 5/16"	1,1 1/16"	2,5 3/32"	0,153	5 3/8
5	310 12 1/4"	140 5 1/2"	170 6 3/4"	9 3/8"	13 1/2"	9 3/8"	1,2 1/16	2,8 1/8"	0,210	7 3/8



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28 A/701

"MAMUT" SCREWDRIVER. The blade is made of high quality polished steel; up to size 3 provided with fins and rammed into the handle. Sizes 4-6: the blade with fins rammed to the whole lenght of handle; sizes 7-9: the blade without fins, rammed to the whole length of handle and riveted.

TOURNEVIS "MAMUT". Lame en acier de bonne qualité, polie. Dans les Nos 1—3 la queue de la lame pourvue d'ailettes et enfoncée dans le manche. Dans les Nos 4—6 est la queue de la lame pourvue d'ailettes et enfoncée dans le manche sur toute sa longueur; dans les Nos 7—9 la queue de la lame sans ailettes est enfoncée dans le manche sur toute sa longueur et rivetée.

SCHRAUBENZIEHER „MAMUT". Klinge aus Qualitätsstahl, poliert; bis 3 mm mit Platte versehen und im Heft eingesetzt. Ab Nr. 4 bis 6 ist die Klinge mit Platte der ganzen Länge des Heftes nach eingesetzt und ab Nr. 7 bis 9 Klinge ohne Platte der ganzen Länge nach im Heft eingesetzt und durchgenietet.

DESTORNILLADOR "MAMUT". Hoja de acero de calidad, pulida; hasta el No 3 equipada con aletas y encajada en el mango. Desde el No 4—6 la varilla con aletas, encajada a través del mango. El No 7—9 sin aletas, encajada a través del mango y remachada.

Size No Größe Nr. Grandeur No Tamaño No	L	M	N	P	R
1	185 *7 1/4"*	95 *3 3/4"*	90 *3 1/2"*	3,5 *1/8"*	4 *5/32"*
2	195 *7 5/8"*	95 *3 3/4"*	100 *4"*	4 *5/32"*	4,5 *3/16"*
3	220 *8 5/8"*	100 *4"*	120 *4 3/4"*	4,5 *3/16"*	6 *1/4"*

Size No Größe Nr. Grandeur No Tamaño No	S	T	U	V	X	kg	ozs
1	2,5 *3/32"*	0,4 *1/64"*	50 *2"*	90 *3 1/2"*	140 *5 1/2"*	0,035	*1 1/4*
2	3,5 *1/8"*	0,5 *1/64"*	50 *2"*	100 *4"*	150 *6"*	0,040	*1 3/8*
3	5 *3/16"*	0,6 *1/32"*	50 *2"*	120 *4 3/4"*	170 *6 3/4"*	0,050	*1 3/4*

	L	M	N	P	R	S	T	V	kg	ozs
4	245 *9 5/8"*	105 *4 1/8"*	140 *5 1/2"*	5,5 *7/32"*	7 *9/32"*	6 *1/4"*	0,8 *1/32"*	2 *3/32"*	0,070	*2 1/4*
5	270 *10 5/8"*	110 *4 3/8"*	160 *6 3/8"*	7 *9/32"*	9 *3/8"*	8 *5/16"*	1,1 *1/16"*	2,5 *3/32"*	0,120	*4 1/4*
6	295 *11 5/8"*	115 *4 1/2"*	180 *7 1/8"*	8 *5/16"*	10 *13/32"*	9 *3/8"*	1,2 *1/16"*	2,8 *1/8"*	0,160	*6 5/8*
7	320 *12 5/8"*	117 *4 5/8"*	203 *8"*	9 *3/8"*	11 *7/16"*	10 *13/32"*	1,6 *1/16"*	3 *1/8"*	0,200	*7*
8	350 *13 3/4"*	127 *5"*	223 *8 3/4"*	10 *13/32"*	14 *9/16"*	13 *1/2"*	2 *3/32"*	3,5 *1/8"*	0,280	*9 13/16*
9	350 *13 3/4"*	127 *5"*	223 *8 3/4"*	13 *1/2"*	18 *23/32"*	16 *5/8"*	4,5 *3/16"*	3,8 *5/32"*	0,480	*16 1/8*

TRADE MARK

29 A/369

ELMONT SCREWDRIVER. The blade is made of high quality polished steel, with fins, rammed into the wooden handle.

TOURNEVIS "ELMONT". Lame en acier de bonne qualité, polie, avec queue à ailettes, enfoncée dans un manche en bois.

SCHRAUBENZIEHER „ELMONT". Klinge aus Qualitätsstahl, poliert, mit Platte versehen, im Holzgriff eingesetzt.

DESTORNILLADOR "ELMONT". Hoja de acero de calidad, pulida, con aletas, encajada en el mango de madera.

Dimensions / Abmessungen / Dimensions / Dimensión :

Size No Größe Nr. Grandeur No Tamaño No	L	M	N	P	R	S	T	U	V	kg	ozs
1	170 *6 3/4"*	90 *3 1/2"*	80 *3 1/8"*	3,5 *1/8"*	4 *5/32"*	2,6 *3/32"*	0,4 *1/64"*	35 *1 3/8"*	115 *4 1/2"*	0,025	*1 7/8*
2	195 *7 3/4"*	95 *3 3/4"*	100 *4"*	3,5 *1/8"*	5 *3/16"*	3,5 *1/8"*	0,5 *1/64"*	40 *1 5/8"*	140 *5 1/2"*	0,030	*1 1/16*
3	220 *8 5/8"*	100 *4"*	120 *4 3/4"*	4 *5/32"*	5,9 *1/4"*	4 *5/32"*	0,5 *1/64"*	45 *1 3/4"*	165 *6 1/2"*	0,040	*1 3/8*
4	250 *9 7/8"*	110 *4 3/8"*	140 *5 1/2"*	4 *5/32"*	6 *1/4"*	4,5 *3/16"*	0,6 *1/32"*	50 *2"*	190 *7 1/2"*	0,045	*1 9/16*
5	280 *11"*	120 *4 3/4"*	160 *6 1/4"*	4,6 *3/16"*	6,5 *1/4"*	6 *1/4"*	0,6 *1/32"*	55 *2 1/8"*	215 *8 1/2"*	0,050	*1 3/4*
6	290 *11 1/2"*	120 *4 3/4"*	170 *6 3/4"*	5 *3/16"*	9 *3/8"*	7 *9/32"*	0,8 *1/32"*	55 *2 1/8"*	225 *8 7/8"*	0,055	*1 15/16*
7	290 *11 1/2"*	120 *4 3/4"*	170 *6 3/4"*	5,5 *7/32"*	10 *13/32"*	8 *5/16"*	1 *1/32"*	55 *2 1/8"*	225 *8 7/8"*	0,060	*2 1/8*

TRADE MARK

30 A/268

"VERTOR" DOUBLE ENDED SCREWDRIVER — reversible — blade made of high quality polished steel.

TOURNEVIS DOUBLE "VERTOR" — à emmancher d'un et de l'autre coté — lame en acier de bonne qualité, polie.

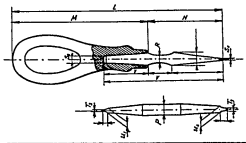
DOPPELSEITIGER SCHRAUBENZIEHER „VERTOR" — beiderseitig verwendbar — Klinge aus Qualitätsstahl, poliert.

DESTORNILLADOR DOBLE "VERTOR" — para utilisar de ambos lados — barra de acero de calidad, pulida.

Dimensions / Abmessungen / Dimensions / Dimensiones:

Size No Größe Nr. Grandeur No Tamaño No	L	M	N	P	R	S1	S2
1	150 *6"*	100 *4"*	60 *2"*	3 *1/8"*	8 *5/16"*	5 *3/16"*	4 *5/32"*
2	170 *6 3/4"*	105 *4 1/8"*	65 *2 1/2"*	4 *5/32"*	11 *7/16"*	8 *5/16"*	6 *1/4"*
3	195 *7 3/4"*	110 *4 3/8"*	85 *3 3/8"*	4 *5/32"*	13 *1/2"*	9 *3/8"*	7 *5/16"*
4	220 *8 5/8"*	120 *4 3/4"*	100 *4"*	5 *3/16"*	14 *9/16"*	10 *13/32"*	8 *5/16"*
5	250 *9 7/8"*	130 *5 1/8"*	120 *4 3/4"*	5 *3/16"*	16 *5/8"*	11 *7/16"*	9 *3/8"*
6	275 *10 7/8"*	140 *5 1/2"*	135 *5 3/8"*	6 *1/4"*	17 *11/16"*	12 *15/32"*	10 *13/32"*

Size No Größe Nr. Grandeur No Tamaño No	T1	T2	U1	U2	V	X	Weight Gewicht Poids / Peso kg	ozs
1	0,6 *1/32"*	0,5 *1/32"*	1,8 *1/16"*	1,8 *1/16"*	30 *1 1/4"*	80 *3 1/8"*	0,04	*1 3/8*
2	1 *1/32"*	0,8 *1/32"*	2 *3/32"*	2 *3/32"*	30 *1 1/4"*	95 *3 3/4"*	0,06	*2 1/8*
3	1 *1/32"*	0,8 *1/32"*	2,2 *3/32"*	2,2 *3/32"*	30 *1 1/4"*	115 *4 1/2"*	0,08	*2 7/8*
4	1,2 *1/16"*	1 *1/32"*	2,8 *1/8"*	2,8 *1/8"*	30 *1 1/4"*	130 *5 1/8"*	0,10	*3 1/2*
5	1,2 *1/16"*	1 *1/32"*	3 *1/8"*	3 *1/8"*	35 *1 3/8"*	135 *5 3/8"*	0,13	*4 1/2*
6	1,5 *1/16"*	1 *1/32"*	3 *1/8"*	3 *1/8"*	40 *1 5/8"*	175 *6 7/8"*	0,16	*6 5/8*



TRADE MARK

31 A/360

"PERFECT" SCREWDRIVER. Solid blade forged of high quality polished steel. Riveted handle made of bakelite, plastics or wood.

TOURNEVIS "PERFECT". Lame robuste forgée en acier de bonne qualité, polie. Les garnitures du manche en bakélite, matière plastique ou en bois sont fixées par les rivets.

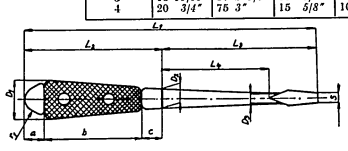
SCHRAUBENZIEHER „PERFECT". Starke geschmiedete Klinge aus Qualitätsstahl, poliert. Durchgenietete Schalen aus Bakelit, Kunstmasse oder Holz.

DESTORNILLADOR "PERFECT". Hoja robusta herrada de acero de calidad, pulida. Cachas de material plástico, bakelita o de madera.

Dimensions / Abmessungen / Dimensions / Dimensiones:

Size No Größe Nr. Grandeur No Tamaño No	L1	L2	L3	D1	D2	D3	R1
1	150 *6"*	70 *2 3/4"*	80 *3 1/4"*	10 *3/4"*	10 *13/32"*	5 *3/16"*	14 *9/16"*
2	200 *8"*	80 *3 1/8"*	120 *4 3/4"*	27 *1 1/8"*	14 *9/16"*	7 *5/16"*	17 *11/16"*
3	250 *10"*	90 *3 1/2"*	160 *6 1/4"*	28 *1 1/8"*	17 *11/16"*	8 *5/16"*	20 *3/4"*
4	300 *12"*	110 *4 3/8"*	190 *7 1/2"*	30 *1 1/4"*	18 *23/32"*	9 *3/8"*	22 *7/8"*

Size No Größe Nr. Grandeur No Tamaño No	a	b	c	S	L4	Weight / Gewicht Poids / Peso kg	ozs
1	10 *13/32"*	50 *2"*	10 *13/32"*	5/0,6 *3/16"/11/32"*	55 *2 1/8"*	0,065	*2 1/4*
2	15 *5/8"*	50 *2"*	15 *5/8"*	7/1 *5/16"/11/32"*	85 *3 3/8"*	0,135	*4 3/4*
3	18 *11/16"*	57 *2 1/4"*	15 *5/8"*	9/1,2 *3/8" /11/16"*	125 *5"*	0,200	*7*
4	20 *3/4"*	75 *3"*	15 *5/8"*	10/1,6 *13/32"/11/16"*	145 *5 3/4"*	0,300	*10 1/2*



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32 A/366

"ISOLA" SCREWDRIVER. The blade is made of high quality polished steel, with fins, the handle is made of electricity-insulating materials. Applied in electrical engineering for loosening and tightening of screws.

TOURNEVIS "ISOLA". Lame en acier de bonne qualité, polie, avec queue à ailettes, manche en matière isolante. Employé par électriciens pour desserrer et serrer les vis.

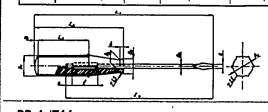
SCHRAUBENZIEHER „ISOLA". Klinge aus Qualitätsstahl, poliert mit Platte, Handgriff aus Elektroisoliermasse. Zur Verwendung in der Elektrotechnik für Lockerung und Anziehen von Schrauben.

DESTORNILLADOR "ISOLA". Hoja de acero de calidad, pulida, con aletas, mango de material aislante. Sirve a los electrotécnicos para aflojar o sujetar tornillos.

Dimensions / Abmessungen / Dimensions / Dimensiones:

Size No Größe Nr. Grandeur No Tamaño No	Handle / Handgriff / manche / mango								
	L1	L2	L3	D1	D2	D3	D5	a	b
1	140 *5 1/2"*	70 *2 3/4"*	40 *1 5/8"*	15 *19/32"*	10 *13/32"*	11 *7/16"*	12 *13/16"*	3 *1/8"*	3 *1/8"*
2	170 *6 3/4"*								
3	210 *8 1/4"*	85 *3 3/8"*	50 *2"*	17 *11/16"*	12 *15/32"*	13 *1/2"*	14 *9/16"*	3 *1/8"*	3 1/8"
4	235 *9 1/4"*								
5	275 *10 7/8"*	100 *4"*	60 *2 3/8"*	20 *13/16"*	15 *19/32"*	16 *5/8"*	17 *11/16"*	3 1/8	3 1/8"
6	300 *11 7/8"*								

	Blade / Klinge / lame / hoja						Weight of one piece Gewicht eines Stks. Poids d'une pièce Peso de una pieza	
	L4	g	D4	e	f	s	kg	ozs
1	115 *4 1/2"*	25 *1"*	3,5 *1/8"*	5 *3/16"*	20 *3/4"*	2,6/0,4 *3/32"/1/64"*	0,035	*1 1/4*
2	145 *6 3/4"*	25 *1"*	3,5 *1/8"*	5 *3/16"*	20 *3/4"*	2,5/0,5 *3/32"/1/64"*	0,035	*1 1/4*
3	170 *6 3/4"*	25 *1"*	4 *5/32"*	5 *3/16"*	20 *3/4"*	4/0,5 *5/32"/1/64"*	0,049	*1 3/4*
4	195 *7 3/4"*	25 *1"*	4 *5/32"*	5 *3/16"*	20 *3/4"*	4,5/0,6 *3/16"/1/32"*	0,049	*1 3/4*
5	220 *8 5/8"*	25 *1"*	5 *3/16"*	5 *3/16"*	20 *3/4"*	6/0,6 *1/4" 1/32"*	0,061	*2 1/8*
6	245 *9 5/8"*	25 *1"*	5 *3/16"*	5 *3/16"*	20 *3/4"*	6/0,6 *1/4" 1/32"*	0,061	*2 1/8*



33 A/711

"NORMAL" SCREWDRIVER. The blade is made of high quality polished steel, with fins, rammed into a wooden handle and riveted.

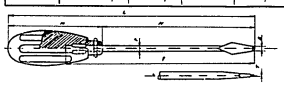
TOURNEVIS "NORMAL". Lame en acier de bonne qualité, polie, avec queue à ailettes, enfoncée dans un manche en bois et rivetée.

SCHRAUBENZIEHER „NORMAL". Klinge aus Qualitätsstahl, poliert, mit Platte, im Holzgriff eingesetzt und durchgenietet.

DESTORNILLADOR "NORMAL". Hoja de acero de calidad, pulida, con aletas, encajada en el mango de madera y remachada.

Dimensions / Abmessungen / Dimensions / Dimensiones:

Size No Größe Nr. Grandeur No Tamaño No								Weight per one piece Gewicht per ein Stück Poids d'une pièce Peso de una pieza	
	L	M	N	P	S	T	V	kg	ozs
1	180 *7 1/8"*	97 *3 7/8"*	83 *3 1/4"*	4 *5/32"*	4 *5/32"*	0,5 *1/32"*	128 *5"*	0,035	*1 1/4*
2	195 *7 3/4"*	100 *4"*	95 *3 3/4"*	5 *5/32"*	5 *5/32"*	0,6 *1/32"*	140 *5 1/2"*	0,050	*1 3/4*
3	220 *8 5/8"*	106 *4 1/4"*	114 *4 1/2"*	6 *1/4"*	6 *1/4"*	0,8 *1/32"*	164 *6 1/2"*	0,065	*2 1/4*
4	250 *10"*	112 *4 3/8"*	138 *5 1/2"*	7 *5/16"*	7 *5/16"*	0,8 *1/32"*	188 *7 3/8"*	0,087	*3 1/16*
5	280 *11"*	120 *4 3/4"*	160 *6 1/4"*	8 *5/16"*	8 *5/16"*	1 *1/32"*	216 *8 1/2"*	0,130	*4 5/8*
6	305 *12"*	123 *4 7/8"*	182 *7 1/8"*	9 *3/8"*	10 *13/32"*	1,2 *1/16"*	237 *9 3/8"*	0,175	*6 1/8*
7	330 *13"*	130 *5 1/8"*	200 *8"*	10 *13/32"*	12 *15/32"*	1,6 *1/16"*	260 *10 1/4"*	0,210	*7 3/8*
8	300 *14 1/4"*	135 *5 3/8"*	225 *9"*	11 *7/16"*	14 *9/16"*	2 *3/32"*	285 *11 1/4"*	0,276	*9 3/4*



34 A/372

"SUPER" SCREWDRIVER. The blade is made of high quality polished steel and rammed whole lenght into the wooden handle and riveted.

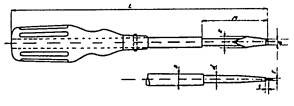
TOURNEVIS "SUPER". Lame en acier de bonne qualité, polie, enfoncée dans un manche en bois sur toute sa longueur et rivetée.

SCHRAUBENZIEHER „SUPER". Klinge aus Qualitätsstahl, poliert, im Handgriff der ganzen Länge nach eingesetzt und durchgenietet. Holzgriff.

DESTORNILLADOR "SUPER". Varilla de acero de calidad, pulida, encajada a través del mango y remachada. Mango de madera.

Size No Größe Nr Grandeur No Tamaño No	Dimensions Abmessungen Dimensions Dimensión			
	L	M	D	d
1	180 *7 1/8"*	40 *1 5/8"*	7 *5/16"*	5 *5/32"*
2	200 *7 7/8"*	45 *1 3/4"*	7 *5/16"*	5 *5/32"*
3	220 *8 5/8"*	50 *2"*	8 *5/16"*	6 *1/4"*
4	240 *9 1/2"*	55 *2 1/8"*	9 *3/8"*	7 *5/16"*
5	260 *10 1/4"*	65 *2 1/2"*	10 *13/32"*	8 *5/16"*
6	280 *11"*	70 *2 3/4"*	11 *7/16"*	9 *3/8"*
7	300 *11 7/8"*	75 *3"*	12 *15/32"*	10 *13/32"*
8	320 *12 5/8"*	80 *3 1/8"*	13 *1/2"*	11 *7/16"*

Size No Größe Nr. Grandeur No Tamaño No	Dimensions Abmessungen Dimensions Dimensión				Weight of one piece Gewicht per 1 Stück Poids d'une pièce Peso de una pieza	
	V	T	R	S	kg	ozs
1	2 *3/32"*	0,5 *1/64"*	6 *1/4"*	4 *5/32"*	0,055	*1 15/16*
2	2,4 *3/32"*	0,6 *1/32"*	7 *5/16"*	5 *5/32"*	0,085	*3*
3	2,8 *1/8"*	0,8 *1/32"*	8 *5/16"*	6 *1/4"*	0,110	*3 7/8*
4	3,2 *1/8"*	0,8 *1/32"*	9 *3/8"*	7 *5/16"*	0,145	*5 1/8*
5	3,4 *1/8"*	1 *1/32"*	10 *13/32"*	8 *5/16"*	0,185	*6 1/2*
6	3,6 *5/32"*	1,2 *1/16"*	12 *15/32"*	10 *13/32"*	0,235	*8 1/4*
7	3,8 *5/32"*	1,6 *1/16"*	14 *9/16"*	12 *15/32"*	0,295	*10 3/8*
8	4 *5/32"*	2 *3/32"*	16 *5/8"*	14 *9/16"*	0,370	*13*



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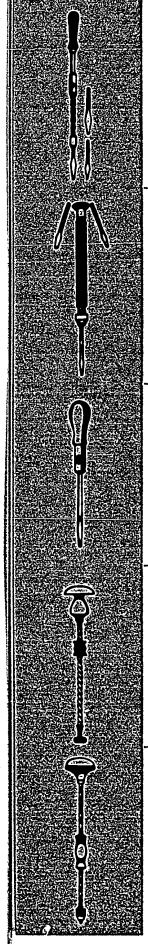

45 A/1118

AUTOMATIC SPIRAL RATCHET SCREWDRIVERS, both right and left turning, with three different interchangeable blades.

TOURNEVIS AUTOMATIQUES À CLIQUET, à droite et à gauche, avec trois lames différentes échangeables.

SELBSTTÄTIGE DRILLSCHRAUBENZIEHER, rechts- und linksgängig, mit drei verschiedenen auswechselbaren Klingen.

DESTORNILLADORES AUTOMATICOS CON CARRACA, derechos e izquierdos con 3 varillas diferentes, recambiables.

Länge / longueur / longitud	500 mm	Gewicht / poids / peso	430 g
Length	*20"*	Weight	*—/15* lbs

46 A/373

WATCHMAKER'S SCREWDRIVERS, universal, 3 exchangeables blades.

TOURNEVIS D'HORLOGER, universels, avec 3 lames rechangeables.

UHRMACHER-SCHRAUBENZIEHER, universal, mit drei auswechselbaren Klingen.

DESTORNILLADORES PARA RELOJEROS, universales, con 3 varillas recambiables.

Gewicht / poids / peso	40 g
Weight	*1 3/8* ozs

47 A/1120

AMERICAN SCREWDRIVERS with RATCHET.

TOURNEVIS À CLIQUET.

KNARRENSCHRAUBENZIEHER.

DESTORNILLADORES CON CARRACA.

Länge / longueur / longitud	150 mm	200 mm	Gewicht / poids / peso	310 gs 500 gs
Length	*6"*	*8"*	Weight	*11* ozs *13 3/4* ozs

48 A/0 — 6

LOCKSMITH'S HAND DRILLS.

PORTE-FORETS DE SERRURIER.

SCHLOSSERDRILLBOHRER.

TALADROS PARA CERRAJEROS.

Gewicht / poids / peso	500 g
Weight	*17 1/2* ozs

49 A/1114

HAND DRILLS — AMERICAN MINIATURE TYPE, with triangular chucks up to 1/4".

PORTE-FORETS AMERICAINES avec mandrins à trois machoires pour forets jusqu'à 6 mm.

AMERIKANISCHER DRILLBOHRER mit dreikantigem Backenbohrfutter bis 6 mm.

TALADROS AMERICANOS con mandrines de 3 mordazas hasta 6 mm.

50 A/

SPIRAL BAG BINDER.

OUTIL À LIER LES SACS, À SPIRES.

SPIRALSACKBINDER.

AGUJA ESPIRAL PARA ATAR BOLSAS.

Länge / longueur / longitud	320 mm	Gewicht / poids / peso	350 g
Length	*12 5/8"*	Weight	*12* ozs

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HAMMERS · HÄMMER · MARTEAUX · MARTILLOS

59 A/1710

UPHOLSTERER'S HAMMER.
MARTEAU DE TAPISSIERS.

TAPEZIERHAMMER.
MARTILLOS PARA TAPICEROS.

Gewicht / poids / peso weight	200 g *7 ozs*

60 A/488

HOUSEHOLD HAMMER, fine black with polished handle.
MARTEAU DE MÉNAGER, noir fin à manches polis.

KLAUENHAMMER, feinschwarz mit poliertem Stiel.
MARTILLOS PARA MENAJE, negro fino con mango pulido.

Gewicht / poids / peso weight	400 g *14 ozs*

TRADE MARK

61 A/25

MACHINISTS' RIVETING HAMMER WITH HANDLE, without sharp edges, black japanned, the face finely ground. Careful hardening guarantees safe application.
MARTEAU DE SERRURIER À RIVER, AVEC MANCHE, sans arêtes vives, verni noir, panne finement meulée. La trempe soignée du marteau garantit un emploi sur.

SCHLOSSERNIETHAMMER MIT STIEL, ohne scharfe Kanten, schwarz lackiert, Schlagflächen fein geschliffen. Sorgfältige Härtung verbürgt verläßliche Verwendung.
MARTILLOS DE MÉCANICOS PARA REMACHAR CON MANGO sin cantos vivos barnizado en negro, caras finamente cepilladas. Temple perfecto garantiza el uso seguro.

Gewicht ohne Stiel poids sans manche peso sin mango weight without handle	150 *5 1/4*	300 *10 1/2*	450 *16*	600 *21*	1000 *35*	1500 *53*	g ozs
Länge longueur longitud length	88 *3 1/2*	105 *4 1/8*	122 *4 7/8*	135 *5 3/8*	145 *5 3/5*		mm inches
Abmessungen der Schlagfläche dimensions de la panne dimensiones de cara face dimensions	17 × 17 *11/16 × 11/16*	23 × 23 *7/8 × 7/8*	29 × 29 *1 1/8 × 1 1/8*	36 × 36 *1 7/16 × 1 7/16*	42 × 42 *1 5/8 × 1 5/8*		mm inches
Abmessungen der Stielöffnung dimensions de l'ouverture pour la manche dimensiones de la abertura del mango hammer hole dimensions	18 × 18 *23/32 × 23/32*	20 × 11.2 *25/32 × 7/16*	26.5 × 15 *1 1/32 × 19/32*	36 × 17 *1 7/16 × 11/16*	31.5 × 18 *1 1/4 × 23/32*		mm inches

Packing: up to 21 ozs 6 pieces per paper package, above 21 ozs loosely in cases.
Verpackung: bis 600 g im Papierpackchen je 6 Stück, über 600 g lose in Kästen.
Emballage: jusqu'à 600 g en paquets de papier par 6 pièces, plus que 600 g en vrac en caisses.
Embalaje: hasta 600 g en paquetes de papel a 6 piezas, sobre 600 g libre en cajas.

TRADE MARK

62 A/484

JOINERS' SHAMMER WITH HANDLE, forged of high quality steel, black japanned. The hammer face and pane are finely ground.
MARTEAU DE MENUISIER avec manche, forgé en acier de bonne qualité, verni noir. La panne et la penne sont finement polies.

SCHREINERHAMMER mit Stiel, aus Qualitätsstahl geschmiedet, mit schwarzem Lack lackiert. Schlagfläche und Pinne feingeschliffen.
MARTILLOS PARA CARPINTEROS con mango, forjado herrarado, de acero de calidad, barnizado en negro. Cara y cabeza del martillo finamente cepilladas.

Länge / longueur / longitud length	108 mm *4 1/4"*	
Abmessungen der Schlagfläche dimensions de la panne dimension de cara face dimensions	25×22 mm *1×7/8"*	
Gewicht ohne Stiel poids sans manche peso sin mango weight without handle	320 g *11 1/4 ozs*	
Gewicht mit Stiel poids avec manche peso con mango weight with handle		305 g *14 ozs*

TRADE MARK

63 A/592

SCYTHE HAMMER single sided.
MARTEAU À FAUX SIMPLE.

SENSENHAMMER, einseitig.
MARTILLO PARA GUADAÑAS, unilateral.

Gewicht / poids / peso weight	400 g *14 ozs*

Packed loosely in cases.
Verpackung: lose in Kisten.
Emballage: en vrac en caisse.
Embalaje: libre en cajas.

TRADE MARK

64 A/590

SCYTHE HAMMER DOUBLE ENDED.
MARTEAU À FAUX, double.

DOPPELSEITIGER SENSENHAMMER.
MARTILLOS PARA GUADAÑAS DOBLES.

Gewicht / poids / peso weight	450 g *16 ozs*

Packed loosely in cases.
Verpackung: lose in Kisten.
Emballage: en vrac en caisse.
Embalaje: libre en cajas.

TRADE MARK

65 A/580

SCYTHE ANVIL.
ECLUMETTES À FAUX.

SENSENAMBOSSE.
YUNQUILLOS PARA GUADAÑAS.

Gewicht / poids / peso weight	400 g *14 ozs*

Packed loosely in cases.
Verpackung: lose in Kisten.
Emballage: en vrac en caisse.
Embalaje: libre en caja.

TRADE MARK

66 A/601

GRANITE HAMMER with bevelled edges.
MASSES À PIERRE avec arêtes biseautées.

STEINSCHLÄGEL mit abgeschrägten Kanten.
MAZAS PARA PIEDRAS con cantos biselados.

Gewicht / poids / peso weight	1 *2/3*	1 1/2 *3/5*	2 *4/7*	2 1/2 *5/8*	3 *6/10*	4 *8/13*	5 kg *11*/-lbs
Gewicht / poids / peso weight	6 *13/4*	7 *15/7*	8 *17/10*	9 *19/12*	10 kg *22* lbs		

Packed loosely in cases.
Verpackung: lose in Kisten.
Emballage: en vrac en caisse.
Embalaje: libre en cajas.

TRADE MARK

MOTOKOV · PRAHA · CZECHOSLOVAKIA

A

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67 A/500

GRANITE HAMMER with sharp edges.
MASSE À PIERRE avec arêtes vives.

STEINSCHLÄGEL, scharfkantig.
MAZAS PARA PIEDRAS con cantos vivos.

Gewicht / poids / peso	1	1 1/2	2	2 1/2	3	4	5 kg
weight	2/3	2/5	4/7	5/8	6/10	8/12	11/-lbs
Gewicht / poids / peso			6	7	8	9	10 kg
weight			13/4	15/7	17/10	19/12	22 lbs

Packed loosely in cases.
Verpackung: lose in Kisten.
Emballage: en vrac en caisse.
Embalaje: libre en cajas.

TRADE MARK

68 A/16

STRAIGHT PANE.
MARTEAU DE FORGERON DE DEVANT.

VORSCHLAGHAMMER.
MARTILLOS PARA HERREROS CON PUNTA HORIZONTAL.

Gewicht / poids / peso	2	3	4	5	8	10 kg
weight	4/7	6/10	8/13	11/-	17/10	22 lbs

Packed loosely in cases.
Verpackung: lose in Kisten.
Emballage: en vrac en caisse.
Embalaje: libre en cajas.

TRADE MARK

69 A/17

CROSS HAMMERS PANE.
MARTEAU DE FORGERON DE TRAVERS.

KREUZSCHLAGHAMMER.
MARTILLOS PARA HERREROS CON PUNTA VERTICAL.

Gewicht / poids / peso	2	3	4	5	8	10 kg
weight	4/7	6/10	8/13	11/-	17/10	22 lbs

Packed loosely in cases.
Verpackung: lose in Kisten.
Emballage: en vrac en caisse.
Embalaje: libre en cajas.

TRADE MARK

70 A/608

HAMMER FOR BREAKING STONES.
MASSE POUR FENDRE LA PIERRE.

STEINSPALTHAMMER.
MAZAS PARA PARTIR PIEDRAS.

Gewicht / poids / peso	2	3	4	5	6	7	8	kg
weight	4/7	6/10	8/13	11/-	13/4	15/7	17/10	lbs

Packed loosely in cases.
Verpackung: lose in Kisten.
Emballage: en vrac en caisse.
Embalaje: libre en cajas.

TRADE MARK

71 A/709

BRICKLAYER'S HAMMER.
MARTEAU DE MAÇON.

MAURERHAMMER.
MARTILLOS PARA ALBAÑILES.

Gewicht / poids / peso	650 g
weight	23 ozs

Packed loosely in cases.
Verpackung: lose in Kisten.
Emballage: en vrac en caisse.
Embalaje: libre en cajas.

TRADE MARK

72 A/512

SHOEMAKER'S HAMMER, finely polished.
MARTEAU DE CORDONNIER, finement poli.

SCHUSTERHAMMER, fein poliert.
MARTILLOS PARA ZAPATEROS, finamente pulidos.

Gewicht / poids / peso	400 g
weight	14 ozs

Packed loosely in cases.
Verpackung: lose in Kisten.
Emballage: en vrac en caisses.
Embalaje: libre en cajas.

72 A/512 1/2

SHOEMAKER'S HAMMER, finely polished with handle.
MARTEAU DE CORDONNIER, finement poli, avec manche.

SCHUSTERHAMMER, fein poliert, mit Stiel.
MARTILLOS PARA ZAPATEROS finamente pulidos con mango.

Gewicht / poids / peso	400 g
weight	14 ozs

Packed loosely in cases.
Verpackung: lose in Kisten.
Emballage: en vrac en caisses.
Embalaje: libre en cajas.

72 A/514

SHOEMAKER'S HAMMER, black, with polished face.
MARTEAU DE CORDONNIER, noir, panne polie.

SCHUSTERHAMMER, schwarz, mit polierter Bahn.
MARTILLOS PARA ZAPATEROS, negros, con ranura pulida.

Gewicht / poids / peso	400 g
weight	14 ozs

Packed loosely in cases.
Verpackung: lose in Kisten.
Emballage: en vrac en caisses.
Embalaje: libre en cajas.

72 A/514 1/2

SHOEMAKER'S HAMMER, black, with handle.
MARTEAU DE CORDONNIER, noir, avec manche.

SCHUSTERHAMMER, schwarz, mit Stiel.
MARTILLOS PARA ZAPATEROS, negros, con mango.

Gewicht / poids / peso	400 g
weight	14 ozs

Packed loosely in cases.
Verpackung: lose in Kisten.
Emballage: en vrac en caisse.
Embalaje: libre en cajas.

TRADE MARK

73 A/500

CARPENTER'S HAMMER, with handle.
MARTEAU DE CHARPENTIER avec manche.

ZIMMERMANNSHAMMER mit Stiel.
MARTILLOS PARA CARPINTEROS con mango.

Gewicht / poids / peso	600 g
weight	21 ozs

TRADE MARK

74 A/640

FARRIERS' HAMMER with handle.
MARTEAU DE MARÉCHAL FERRANT avec manche.

HUFSCHMIEDHAMMER mit Stiel.
MARTILLOS PARA HERRADORES con mango.

Gewicht / poids / peso	600 g
weight	21 ozs

TRADE MARK

75 A/734

SLATERS' HAMMER.
MARTEAU DE COUVREUR.

DACHDECKERHAMMER.
MARTILLOS PARA TEJADORES.

Länge / longueur / longitud	330 mm
length	13"

TRADE MARK

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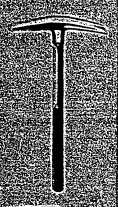
76 A/560

GLAZIER'S HAMMER.
MARTEAU POUR VITRIERS.

GLASERHAMMER.
MARTILLOS PARA VIDRIEROS.

Gewicht / poids / peso	200 g
weight	7 ozs

TRADE MARK



77 A/535

UPHOLSTERER'S HAMMER.
MARTEAU DE TAPISSIER.

TAPEZIERHAMMER.
MARTILLOS PARA TAPICEROS.

Bahndurchmesser / diamètre de la panne	
Diámetro de cuerea	19 mm
Face diameter	¾"

TRADE MARK

78 A/536

SADDLER'S HAMMER, with handle.
MARTEAU DE SELLIER avec manche.

SATTLERHAMMER mit Stiel.
MARTILLOS PARA SILLEROS con mango.

79 A/

ADZES. Made of high quality, polished steel.
DECHSEL, aus Qualitätsstahl, poliert.
HERMINETTES en acier de bonne qualité, poli.
AZUELAS PARA CARPINTEROS, de acero de calidad.

Länge / longueur / longitud	85 mm	width	2 3/4"
length	4"	Gewicht / poids / peso	410 g
Breite / largeur / anchura	7 cm	weight	1 1/2 ozs

80 A/

WAINWRIGHT'S HAMMER.
MARTEAU D'EBENISTIER.

TISCHLERHAMMER.
MARTILLOS PARA EBANISTAS.

Länge / longueur / longitud	185 mm
length	7 1/4"
Gewicht / poids / peso	40 g
weight	1 1/2 ozs

Packing: each piece separately.
Verpackung: je 1 Stück.
Emballage: par 1 pièce.
Embalaje: particular.

ANVILS · AMBOSSE · ENCLUMES · YUNQUES

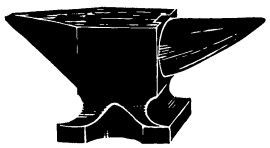
89 A/6

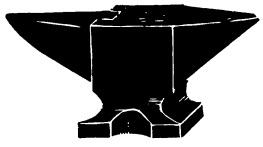
BULGARIAN TYPE ANVIL — with one square and one round hole or with two round and one circumferencial hole, according to requirements.

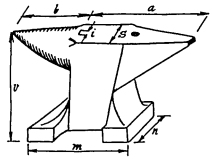
ENCLUME MODÈLE BULGARE — avec une ouverture carrée et une ouverture ronde. Sur demande, avec deux ouvertures rondes et une ouverture sur le périmètre.

BULGARISCHER AMBOSS — mit einem vierkantigen und einem runden Loch bzw. auf Wunsch mit zwei runden und einem Umfangsloch.

YUNQUES MODELO BULGARO — con una abertura cuadrangular y otra redonda o eventualmente según a deseo con dos aberturas redondas y una en circunferencia.







Gewicht / poids / peso	weight	dimensions - Abmessungen - dimensions - dimensiones					
kg	lbs	a		b		s	
30	66	295	11 5/8"	145	5 3/4"	90	3 1/2"
50	110	350	13 3/4"	160	6 3/8"	110	4 3/8"
90	198	430	17"	210	8 1/4"	140	5 1/2"

dimensions Abmessungen - dimensions - dimensiones							
i		v		m		n	
20	3/4"	185	7 1/4"	210	8 1/4"	145	5 3/4"
20	3/4"	225	8 7/8"	265	10 1/2"	180	7 1/8"
27	1 1/8"	280	11"	290	11 1/2"	205	8"

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VICES · SCHRAUBSTÖCKE · ÉTAUX · TORNOS Y TORNILLOS

92A/2" — 92A/3"

TYPE PIONER BENCH PIPE VICE. Steel nut, spindle with handle bars, fixed jaws, link, pin, chain.

ÉTAU DE TABLE POUR TUBES — «PIONER». Écrou en acier, dégueté avec tourne-à-gauche, mâchoires solides, étau de guillage, clavette, chaînette.

	2"	3"
Breite / largeur anchura width	70 mm 2 3/4"	70 mm 2 3/4"
Höhe / hauteur altura height	180 mm 7 1/8"	180 mm 7 1/8"
Länge / longueur longitud length	355 mm 28"	445 mm 17 1/2"
Gewicht / poids peso weight	7,250 kg 16/— lbs	9,100 kg 20/— lbs

TISCHBOHRSCHRAUBSTOCK „PIONYR". Stahlmutter, Spindel mit Griffstift, feste Backen, Spange, Stift, Kette.

TORNOS DE MESA PARA TUBOS, PIONYR. Tuerca de acero hueco con pasador, mordazas fijas con sujetador, tachuela, cadenilla.

Packing: each piece separately in corrugated paper.
Verpackung: je 1 Stück in Wellpappe.
Emballage: par 1 pièce en carton ondulé.
Embalaje: una pieza en cartón ondeado.

91A/3008 — 91A/3009

WATCHMAKER'S HAND VICE, forged of high quality steel, fully polished.

ÉTAU D'HORLOGER, à main forgé, en acier de bonne qualité, entièrement poli.

	3008	3009
Länge / longueur longitud length	110 mm 4 3/8"	130 mm 5 1/8"
Gewicht / poids peso weight	40 g 1 3/8 ozs	62 g 2 1/8 ozs

UHRMACHER-STIELKLOBEN, geschmiedet aus Qualitätsstahl, ganz poliert.

TORNILLO DE MANO PARA RELOJEROS, de acero de calidad, completamente pulido.

Packing: each piece separately in a cardboard-box.
Verpackung: in Pappschachteln je 3 Stück.
Emballage: en boites de carton par 3 pièce.
Embalaje: en cajas de cartón a una pieza.

92A/168 with a wing-nut / mit Flügelmutter / avec écrou à oreilles / con tuerca a orejas
92A/176 with crank / mit Kurbel / avec manette / con varilla.

HAND VICES — WIDE JAWS. Ground and polished jaws, other surface parts black varnished.

ÉTAUX À MAIN AVEC MÂCHOIRES LARGES. Mâchoires finies à la meule et polies, les autres surfaces vernies noir.

	I	II	III
Länge / longueur longitud length	120 mm 4 3/4"	140 mm 5 1/2"	150 mm 5 7/8"
Backenbreite / largeur des mâchoires anchura de mordazas jaw width	42 mm 1 5/8"	48 mm 1 7/8"	48 mm 1 7/8"
Kopfbreite / largeur de la tête anchura de la cabeza head width	52 mm 2"	58 mm 2 1/4"	44 mm 1 3/4"
Max. Backenweite / écartement maximum des mâchoires env. / abertura máxima de mordazas aprox. /	24 mm	28 mm	30 mm
maximum opening of jaws approx.	1"	1 1/8"	1 1/4"
Gewicht / poids peso weight	0,65 g 22 3/4	0,75 g 26 1/4	0,95 g 33 1/4 ozs

HANDFEILKLOBEN — BREITE BACKEN. Die Backen geschliffen und poliert, übrige Flächen schwarz lackiert.

TORNILLOS DE MANO CON MORDAZAS ANCHAS. — Mordazas cepilladas y pulidas, otras áreas barnizadas en negro.

Packing: 2 pieces per package of oil paper.
Verpackung: in Ölpapier je 2 Stück.
Emballage: en papier gras par 2 pieces.
Embalaje: en papel engrasado a 2 piezas.

TRADE MARK

93 A/188

HAND VICE FOR TELEGRAPH MOUNTING, consists of vice, forged of high quality steel, and a tensioner, made of tempered cast iron. The vice jaws are ground and polished; other surface parts are black varnished.

ÉTAU DE TELEGRAPHISTE comprenant: bloc de serrage forgé en acier de bonne qualité et tendeur en fonte malléable. Mâchoires meulées et polies, les autres surfaces vernies noir.

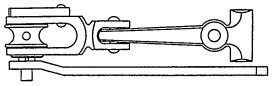
Länge des Feilkolbens longueur de l étau entier longitud de tornillo completo length of the whole vice	230 mm 9"
Länge der Zwinge longueur du bloc de serrage longitud de tornillo length of the vice proper	140 mm 5 1/2"
Länge des Spanners longueur du tendeur longitud del tender length of the tensioner	90 mm 3 1/2"

TELEGRAPHEN-FEILKLOBEN, zusammengesetzt aus einer aus Qualitätsstahl geschmiedeten Zwinge und aus einem Tempergu8-Spanner. Die Backen sind geschliffen und poliert, die übrige Oberfläche schwarz lackiert.

TORNILLOS PARA TELÉGRAFO combinada de tornillo, herrado de acero de calidad, y tender de fundición temperada. Mordazas cepilladas y pulidas, las demás partes barnizadas en negro.

Backenbreite / largeur de mâchoires ancho de mordazas width of jaws	70 mm 2 3/4"
Gewicht / poids peso weight	1,75 kg 3/13 5/8 lbs

Packing: each piece separately in oil paper.
Verpackung: in Ölpapier je 1 Stück.
Emballage: en papier gras par 1 pièce.
Embalaje: en papel engrasado a una pieza.



TRADE MARK

94 A/1140/T 13 — 94 A/1140/T 15

BREAST BORING MACHINE, made of high quality steel materials. Type T 13 with clamping head, type T 15 with clamping head and cone, enabling the clamping of a tool with cylindrical stem. Applied to hand drilling and boring in assembly work and workshops.

PORTE-FORET À CARTER en aciers de bonne qualité. Type T 13 avec tête de fixation des outils, type T 15 avec tête de fixation et cône permettant la fixation des outils à queue cylindrique. Pour le perçage à la main au montage et dans les ateliers.

	T 13	T 15
Länge / longueur longitud length	445 mm 17 1/2"	465 mm 18 1/4"
Gewicht / poids peso weight	2,80 kg 6/2 5/8	3,20 kg 7/5 5/8 lbs

BRUSTBOHRMASCHINE aus Qualitätsstahlmaterial. Type T 13 mit Spannkopf, Type T 15 mit Spannkopf und Kegel, der die Einspannung der Werkzeuge mit Walzenstiel ermöglicht. Verwendung: zum Handbohren bei Montagen und in Werkstätten.

TALADRADORA DE PECHO de materiales de acero de calidad. TIPO T 13 con mandril, TIPO T 15 con mandril y cono facilitando sujeción de un instrumento con un cabo cilíndrico. Se emplea para taladrar a mano en los montajes y en talleres.

Packing: each piece separately in a carton.
Verpackung: in Pappschachteln je 1 Stück.
Emballage: en boites de carton par 1 pièce.
Embalaje: en cajas de carton a una pieza.

95 A/1132

HAND DRILL, open up to 1/4".
PORTE-FORET À MAIN sans carter jusqu' a 6 mm.

HANDDRILLBOHRER, offen bis 6 mm.
TALADRADORA DE MANO abierta hasta 6 mm.

Gewicht / poids peso weight	680 g 22 7/8

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96 A/2" — 96 A/3"

TYPE PIONYR PIPE-VICE WITH STAND. The vice consists of a swivel nut, spindle, handle bar, fixed jaw and moving jaw. The stand consists of the girder structure, the vice, the frame, the floor, the bolt, the table, the table locking device, the table clamps, the rear leg guide, the securing pin with chain.

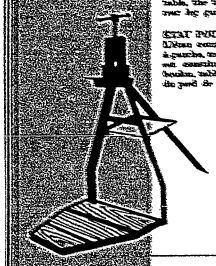
ÉTAU POUR TUYAUX AVEC SUPPORT "PIONYR". L'étau comprend: écrou en acier, axe, tige, mordache à gauche, mâchoire fixe en machine mobile. Le support est constitué par: longeron, étau, cadre, plancher, boulon, table, serrure de table, agrafes de table, guidage du pied de derrière, cheville de sûreté avec chaînette.

ROHRSCHRAUBSTOCK „PIONYR" MIT STÄNDER. Der Schraubstock besteht aus Stahlmutter, Spindel, Griffstift, einer festen und einer beweglichen Backe. Der Ständer besteht aus Tragkonstruktion, Schraubstock, Fußboden, Rahmen, Bolzen, Tisch, Tischriegel, Tischschellen, Führung der Hinterstange, Sicherungsstift mit Kette.

TORNO PARA TUBOS CON SOPORTE PLEGABLE. Se compone de tuerca de acero, huso, mordaza, mordaza fija y mordaza movible. El soporte completo está constituido de un portador, torno, cuadro, piso, clavija, mesa, candado de la mesa, grapas de la mesa, guía del pie trasero, pasador de fijación con cadenilla.

	2"	3"
Breite / largeur / anchura	690 mm	690 mm
width	27 1/4"	27 1/4"
Höhe / hauteur / altura	1170 mm	1260 mm
height	46"	50"
Nettogewicht / poids net / peso neto	24,570 kg	26,500 kg
weight	54,4 lbs	58,8 lbs

Packing: the vice in cardboard paper, the stand folded together, secured, unwrapped.
Verpackung: Schraubstock in Papppapier, Ständer zusammengelegt, gesichert, unverpackt.
Emballage: étau en papier, de carton, support plié, fixé et non emballé.
Embalaje: torno en papel de cartón, el soporte plegado, asegurado, no embalado.



97 A/158

TYPE YORK PARALLEL VICE with a cylindrical guide, opening for 3". The front and rear part and the base plate are made of grey cast iron, all other component parts of steel. The vice surface is reared with red varnish, except the machined part.

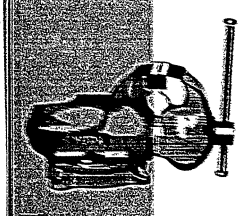
ÉTAU PARALLÈLE "YORK", avec guidage cylindrique, ouverture maxi. de 3". Les pièces de devant et de derrière, ainsi que la plaque de base sont en fonte grise, les autres pièces en acier. Excepté les surfaces usinées, l'étau est verni au pistolet rouge.

PARALLEL-SCHRAUBSTOCK, SYSTEM „YORK", mit Walzenführung, drehbar um 3". Der vordere und rückwärtige Teil mit Grundplatte aus Grauguß, übrige Bestandteile aus Stahl. Die Oberfläche des Schraubstockes ist mit Ausnahme der bearbeiteten Flächen mit rotem Lack überzogen.

TORNILLO YORK paralelo con guía cilíndrica, recibimiento de 3". Parte delantera y trasera y el tablero fundamental de fundición gris, las demás partes de acero. La superficie del tornillo barnizada en rojo, con excepción de la parte trabajada.

	I	II	III	IV	V
Backenbreite / largeur des mâchoires / anchura de bocas	40 mm	50 mm	100 mm	125 mm	150 mm
width of jaws	1 5/8"	2 1/8"	4"	5"	6"
Höhe des Schraubstocks / hauteur de l'étau / altura del torno	140 mm	160 mm	165 mm	215 mm	315 mm
height of vice	5 1/2"	6 3/8"	7 1/4"	8 1/2"	12 3/8"
Länge des Schraubstocks mit geschlossenen Backen / longueur de l'étau à mâchoires fermées / longitud del torno con bocas cerradas	195 mm	235 mm	320 mm	380 mm	410 mm
length of vice with closed jaws	7 3/4"	9 1/4"	12 3/8"	15"	16 1/8"
Max. Backenweite / ouverture max. des mâchoires / máxima abertura de bocas	40 mm	50 mm	95 mm	110 mm	125 mm
maximum opening of jaws	1 5/8"	2 1/8"	3 3/4"	4 3/8"	5"
Spanntiefe / profondeur de fixation / hondura de fijación	40 mm	50 mm	70 mm	85 mm	100 mm
depth of clamping	1 5/8"	2"	2 3/4"	3 3/8"	4"
Gewicht netto / poids net / peso neto	2,500 kg	3,700 kg	14,500 kg	20,000 kg	30,500 kg
weigth	5,5 lbs	8,2 lbs	32 lbs	44 lbs	67,2 lbs

Packing: 1 piece to a cardboard-box, 10, 15 and 20 pieces in a crate, pieces size III to V each piece separately in crates.
Verpackung: Schraubstock in Pappschachteln je 1 Stück, in Holzverschlag je 10, 15 und 20 Stück, Schraubstöcke Größe III bis V je 1 Stück in Latten-Verpackung.
Emballage: étaux grandeur I et II par 10 pièces en boîte de carton, étaux grandeur III à V par une pièce dans caisse.
Embalaje: tornillo de tamaño I a IV de 10 piezas en caja de cartón, V en huacal.



98 A/204

TYPE MINOR PARALLEL VICE with a cylindrical guide and a clamping screw for fastening to the bench. The top and bottom parts are made of grey cast iron, all other component parts are of steel. The vice surface is coated with red varnish, except the machined parts.

ÉTAU PARALLÈLE "MINOR", avec guidage cylindrique et vis de fixation sur la table. Les pièces supérieure et inférieure sont en fonte grise, les autres pièces en acier. Excepté les surfaces usinées, l'étau est verni au pistolet en rouge.

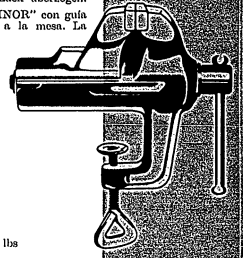
PARALLEL-SCHRAUBSTOCK „MINOR" mit Walzenführung und Zwinge zur Tischbefestigung. Der obere und untere Teil aus Grauguß, übrige Bestandteile aus Stahl. Oberfläche des Schraubstockes ist mit Ausnahme der bearbeiteten Flächen mit rotem Lack überzogen.

TORNILLO PARALELO "MINOR" con guía cilíndrica contero para fijar a la mesa. La parte superior e inferior de fundición gris, las demás de acero. La superficie del tornillo barnizada en rojo con excepción de la parte trabajada.

Backenbreite / largeur des mâchoires / anchura de bocas	70 mm
width of jaws	2 3/4"
Höhe des Schraubstocks / hauteur de l'étau / altura del torno	130 mm
height of vice	5 1/4"
Länge des Schraubstocks mit geschlossenen Backen / longueur de l'étau à mâchoires fermées / longitud del torno con bocas cerradas	140 mm
length of vice with closed jaws	5 1/2"
Max. Backenweite / ouverture max. des mâchoires / máxima abertura de bocas	40 mm
maximum opening of jaws	1 5/8"
Spanntiefe / profondeur de fixation / hondura de fijación	40 mm
depth of clamping	1 5/8"
Gewicht netto / poids net / peso neto	1,6 kg
weigth	3/8 3/8 lbs

Packing: 1 piece to a cardboard-box, 10, 15 and 20 pieces in a crate.
Verpackung: in Pappschachteln je 1 Stück, in Holzverschlag je 10, 15 und 20 Stück.

Emballage: 1 pièce en boite de carton, 10, 15 et 20 pièces en cages.
Embalaje: 1 pieza an caja de carton, 10, 15 y 20 piezas en huacal.



99 A/1170

EMERY WHEEL DRESSER.

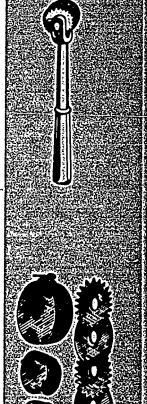
OUTIL À RECTIFIER LES DISQUES A MEULER.

RITZRÄDCHEN zum Abrichten von Schleifscheiben.

ALLANADOR DE DISCOS PARA AFILAR.

ø des Rädchens / diamètre des molettes / ø de ruedas	I	II
	30 mm	50 mm
wheel diameter	1 3/16"	2"
Gewicht / poids / peso	1 kg	1,20 kg
weight	2/3	2/10 lbs

Packing: 10 pieces to a carton.
Verpackung: in Schachteln je 10 Stück.
Emballage: en boites par 10 pièces.
Embalaje: cajitas de carton a 10 piezas.



100 A/

COARSE-TOOTHED DRESSING WHEELS, made of high quality steel. Case hardened surface, without further finish. Used for hand dressing of grinding wheels.

MOLETTES À RECTIFIER, À GROSSES DENTS, en acier de bonne qualité. Surface cimentée sans autre traitement. Pour rectifier à main les disques à meule.

GROBZAHNIGE ABRICHTSCHEIBEN aus Qualitätsstahl. Oberfläche zementiert, ohne weitere Behandlung. Zur Handabrichtung von Schleifscheiben.

DISCOS ALLANADORES de dientes ásperos de acero de calidad. Con superficie cementada, sin otros arreglos. Para allanar a mano discos afiladores.

	I	II	III
Durchmesser / diamètre / diamétro diameter	30 mm	40 mm	50 mm
	1 3/16"	1 9/16"	2"
Breite / largeur / anchura width	10,5 mm	10,5 mm	17,3 mm
	13/32"	13/32"	11/6"
Öffnungsdurchmesser / diamètre de l'ouverture diamétro de la abertura hole diameter	7 mm	7 mm	10 mm
	9/32"	9/32"	6/16"
Gewicht / poids / peso weight	0,04 kg	0,097 kg	0,175 kg
	-/1 3/8	-/3 3/8	-/6 1/8

Packing: in cases; sets of 10 pieces in layers. Separate layers covered with wood cuttings and paper.
Verpackung: schichtweise in Kisten, in Bündeln zu je 10 Satz. Die einzelnen Schichten werden mit Holzwolle und Papier durchgelegt.
Emballage: en caisses par couches des faisceaux de 10 pièces; les couches sont séparées par de la tontine de bois et du papier.
Embalaje: en cajas en series, atados de 10 piezas. Las series respectivas se separan con papel y lana de madera.

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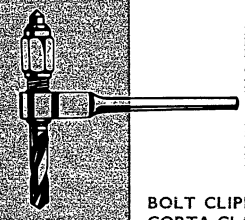
RATCHET BRACES · BOHRKNARREN · CLIQUETS · CARRACAS CHICHARRAS

101 A/384

RATCHET BRACE WITH MORSE CONE.
CLIQUET À CÔNE MORSE.

BOHRKNARRE MIT MORSE-KEGEL.
CHICHARRA CON CONO DE MORSE.



	MK 1	MK 2	MK 3	MK 4
Länge / longueur longitud length	300 mm *12"*	350 mm *14"*	400 mm *16"*	530 mm *21"*
Gewicht / poids peso weight	1,30 kg *2/13 3/4*	1,30 kg *2/13 3/4*	1,80 kg *4/–*	2,40 kg *5/4 1/2* lbs

Packing: 10 pieces per package.
Verpackung: je 10 Stück.
Emballage: par 10 pièces.
Embalaje: a 10 piezas.

TRADE MARK

BOLT CLIPPERS · BOLZENSCHNEIDER · COUPE-BOULONS · CORTA-CLAVIJAS

102 A/260

BOLT CLIPPERS, with adjustable screws.
COUPE-BOULONS avec vis réglables.

BOLZENSCHNEIDER mit verstellbaren Schrauben.
CORTA-CLAVIJAS con tornillos de regulación.

Länge / longueur longitud length	470 mm *18 1/2"*	630 mm *21"*
Gewicht / poids peso weight	1,40 kg *3/1 1/4*	2,60 kg *5/11 1/2* lbs

TRADE MARK

BRACES · BOHRWINDEN · VILEBREQUINS · BERBIQUÍS

103 A/1210

BRACE.
VILEBREQUIN.

BOHRWINDE.
BERBIQUÍS.

Bogenstärke / épaisseur de l'arc grueso de arco thickness of the bow	11 mm *7/16"*
Gewicht / poids peso weight	0,90 kg *2/– lbs*

TRADE MARK

104 A/1216

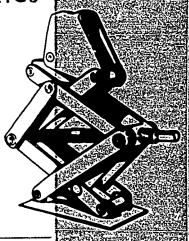
RATCHET BRACE.
VILEBREQUIN À CLIQUET.

BOHRWINDE MIT KNARRE.
BERBIQUÍS PARA PINAS CON CHICHARRA

Bogenstärke / épaisseur de l'arc grueso de arco thickness of the bow	11 mm *7/16"*
Gewicht / poids peso weight	1,26 kg *2/12 1/2* lbs

TRADE MARK

MOTORCAR JACKS · KRAFTWAGENHEBER · CRICS ET PONTS DE LEVAGE POUR AUTOS ALZACOCHES



105 A/1

FOLDING JACK.
CRIC À LEVIER.

SCHERENHEBER.
ALZACOCHE DE TIJERAS.

Tragfähigkeit capacité de levage capacidad de carga load bearing capacity	600 kg *1320* lbs

106 A/2

SCREW-TYPE JACK.
CRIC À VIS.

SCHRAUBENHEBER.
ALZACOCHE DE HUSO.

Tragfähigkeit capacité de levage capacidad de carga load bearing capacity	4000 kg *8800* lbs

107 A/3

AUTOCAR HYDRAULIC JACK.
PONT DE LEVAGE HYDRAULIQUE POUR AUTOS.

HYDRAULISCHER KRAFTWAGEN-HEBER.
ALZACOCHE HIDRÁULICO PARA AUTOMÓVILES.

Tragfähigkeit capacité de levage capacidad de carga load bearing capacity	7000 kg *1500* lbs

108 A/4

HYDRAULIC JACK.
PONT DE LEVAGE HYDRAULIQUE.

HYDRAULISCHER HEBER.
ALZACOCHE HIDRÁULICO.

Tragfähigkeit capacité de levage capacidad de carga load bearing capacity	5000 kg *11000* lbs

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AXES · BEILE · HACHES · HACHUELAS

115 A/162

MINE HATCHET. At the edge ground and coated with transparent lacquer, the other surface part black varnished. Delivered without shaft.

HACHETTE DE MINEUR. Partie tranchante meulée et enduite de vernis incolore. La surface non meulée est vernie noir. Livrée sans manche.

GRUBENBEIL. An der Schneide geschliffen und mit farblosem Lack angestrichen; die übrige ungeschliffene Oberfläche schwarz lackiert. Ohne Stiel geliefert.

HACHUELA DE MINERO. Filo afilado y barnizado con barniz transparente. Superficio restante barnizada en negro. Se suministran sin mango.

Höhe / hauteur / altura height	180 mm 7 1/8"
Breite der Schneide largeur du tranchant anchura del filo width of edge	80 mm 3 1/8"
Gewicht / poids / peso weight	900 g 32 ozs

Packing: Unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans les caisses.
Embalaje: libre en cajas.

TRADE MARK

116 A/1830

HOUSEHOLD AXE. Part of the axe and the edge are heat-treated and ground. The remaining surface is smooth, black varnished. Delivered with shaft; if required by the customer, with a wedge.

HACHETTE DE CUISINE. Une partie de la hache et son tranchant sont trempés et polis. Le reste de la surface est lisse, verni noir. Livrée avec manche, sur désir du client avec languette.

KÜCHENBEIL. Ein Teil des Beiles und die Schneide gehärtet und geschliffen. Die übrige Oberfläche glatt, schwarz lackiert. Es wird mit Stiel — und auf Wunsch des Kunden auch mit Feder — geliefert.

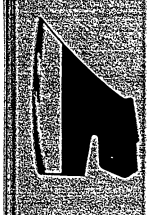
HACHUELA PARA USO DOMESTICO. Una parte de la hachuela y el filo templado y cepillado. Superficie restante lisa, negra. Se suministra con mango, a deseo del cliente con resorte.

Höhe / hauteur altura height	135 mm 5 5/16"	140 mm 5 1/2"	145 mm 5 3/4"	150 mm 6"	165 mm 6 1/2"	175 mm 7"
Breite der Schneide largeur du tranchant anchura del filo width of edge	97 mm 3 13/16"	105 mm 4 1/8"	108 mm 4 1/4"	111 mm 4 3/8"	115 mm 4 1/2"	120 mm 4 3/4"
Gewicht / poids peso weight	500 g 17 1/2	600 g 21	700 g 24 1/2	800 g 28	900 g 32	1000 g 35 ozs

Packing: unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans des caisses.
Embalaje: libre en cajas.

TRADE MARK

117 A/1



BUTCHER'S AXE. Fully polished, coated with transparent lacquer. Delivered without shaft.

HACHE DE BOUCHER entièrement polie, enduite de vernis incolore. Est livrée sans manche.

FLEISCHERAXT, ganzpoliert, mit farblosem Lack angestrichen. Wird ohne Stiel geliefert.

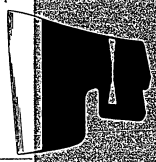
HACHUELA PARA CARNICEROS completamente pulida, barnizada con barniz transparente. Se suministra sin mango.

Höhe hauteur altura height	190 mm 7 1/2"
Breite der Schneide largeur du tranchant anchura del filo width of edge	265 mm 10 1/2"
Gewicht / poids peso weight	1,75 kg 3 1/2 3/4 lbs

Packing: unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans les caisses.
Embalaje: libre en cajas.

TRADE MARK

118 A/2



BUTCHER'S AXE. Fully polished, coated with transparent lacker. Delivered without shaft.

HACHE DE BOUCHER, entièrement polie, enduite de vernis incolore. Est livrée sans manche.

FLEISCHERAXT, ganz poliert, mit farblosem Lack angestrichen. Wird ohne Stiel geliefert.

HACHA PARA CARNICEROS, completamento pulida, barnizada con barniz transparente. Se suministra sin mango.

Höhe / hauteur / altura height	230 mm 9"
Breite der Schneide largeur du tranchant anchura del filo width of edge	185 mm 7 1/4"
Gewicht / poids / peso weight	1,80 kg 4 lbs

Packing: unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans les caisses.
Embalaje: libre en cajas.

TRADE MARK

119 A/142

CARPENTER'S HATCHETS. Part of the hatchet is ground at the edge, coated with transparent lacquer; the rest of the surface is black varnished. Delivered without shaft.

HACHES DE CHARPENTIER — ÉPAULE DE MOUTON. Partie tranchante meulée enduite de vernis incolore. La surface non meulée est vernie noir. Sont livrées sans manches.

ZIMMERMANNBREITAXT. Der Teil an der Schneide geschliffen, mit farblosem Lack angestrichen, die übrige nicht geschliffene Oberfläche schwarz lackiert. Wird ohne Stiel geliefert.

HACHA PARA CARPINTERO. Parte de acha al lado del filo cepillado, barnizada con barniz transparente, superficie restante barnizada en negro. Se suministra sin mango.

Höhe / hauteur / altura height	180 mm 7 1/8"	190 mm 7 1/2"	200 mm 8"
Breite der Schneide / largeur du tranchant anchura del filo width of edge	300 mm 11 7/8"	310 mm 12 1/4"	330 mm 13"
Gewicht / poids / peso weight	1,80 kg 4 lbs	2,- kg 4/6 3/8	2,20 kg 4/13 1/2 lbs

Packing: unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans les caisses.
Embalaje: libre en cajas.

TRADE MARK

120 A/408

BLOCK BILLS. Part of the axe is ground at the edge, coated with transparent lacquer; the rest of the surface is black varnished. Delivered without shaft.

HACHETTES DE CHARRON. Partie tranchante meulée et enduite de vernis incolore. La surface non polie est vernie noir. Sont livrées sans manches.

BEHAU-WAGNERHACKEN. Der Teil an der Schneide geschliffen, mit farblosem Lack angestrichen, die übrige nichtgeschliffene Oberfläche schwarz lackiert. Wird ohne Stiel geliefert.

HACHA PARA CARRETEROS — PARA CORTAR. Parte de hacha y del filo, cepillado, barnizada con barniz transparente, superficie restante barnizada en negro. Se suministra sin mango.

Höhe / hauteur / altura height	170 mm 6 3/4"	175 mm 6 7/8"	190 mm 7 1/2"
Breite der Schneide / lageur du tranchant anchura del filo width of edge	170 mm 6 3/4"	175 mm 6 7/8"	190 mm 7 1/2"
Gewicht / poids / peso weight	1,- kg 2 3/8	1,10 kg 2 3/4	1,40 kg 3/ 3/8

Packing: unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans les caisses.
Embalaje: libre en cajas.

TRADE MARK

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121 A/1840

WOODMAN'S AXE. Part of the axe is heat-treated and ground at the edge. The rest of the surface is smooth, black varnished. Delivered without shaft.

HACHES DE BÛCHERONS À FENDRE. Partie tranchante trempée et polie. Reste de la surface lisse et verni noir. Sont fournies sans manche.

SPALT-HOLZHACKE. Der Teil der Hacke an der Schneide ist gehärtet und geschliffen, die übrige Oberfläche glatt, mit schwarzem Lack angestrichen. Wird ohne Stiel geliefert.

HACHA PARA LEÑADORES PARA RETIRAR TAJOS. Parte de hacha al lado de filo templada y afilada. Superficie restante lisa, barnizada en negro. Se suministra sin mango.

Höhe / hauteur / altura / height	220 mm *8 5/8"*	238 mm *9 3/8"*	250 mm *9 7/8"*
Breite der Schneide / largeur du tranchant / anchura del filo / width of edge	92 mm *3 5/8"*	102 mm *4"*	112 mm *4 3/8"*
Gewicht / poids / peso / weight	1,60 kg *3/8 3/8*	2,— kg *4/6 1/2*	2,50 kg *5/8 lbs*

Packing: unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans les caisses.
Embalaje: libre en cajas.

TRADE MARK

122 A/1847

CARPENTER'S BROAD AXE. The edge is heat-treated to a depth of 30 mm, head untreated. The blade is provided with notches for extraction of nails. The whole surface is smooth, black varnished.

HACHE DE CHARPENTIER À METTRE LES PLANCHES. Partie tranchante trempée sur une largeur de 30 mm env.; tête non trempée. La lame est pourvue d'encoches pour tirer les clous. Toute la surface est lisse et vernie noir.

BESCHLAGZIMMERMANNSBEIL. Die Schneide ist bis zur Entfernung von 30 mm gehärtet, der Kopf ungehärtet. Am Blatt sind Einschnitte zum Nagelausziehen. Die ganze Oberfläche ist glatt, mit schwarzem Lack angestrichen.

HACHA PARA CARPINTEROS PARA PLANCHEAR. Corte templado hasta 30 mm, cabeza no es templada. Sobre la hoja entalladuras para sacar clavos. Toda la superficie es lisa y barnizada en negro.

Länge / longueur / longitud / length	170 mm *6 3/4"*	175 mm *7"*
Abmessungen der Kopf-Schlagfläche / dimensions de la panne de tête / diametro del cara de cabeza / dimensions of the head face	55 × 32 mm *2 3/16 × 1 3/16"*	62 × 32 mm *2 3/8 × 1 1/4"*
Abmessungen der Arbeits-Schlagfläche / dimensions de la panne de travail / diametro del area de trabajo / dimensions of the operational face	35 × 30 *1 3/8 × 1 3/16*	38 × 32 mm *1 1/2 × 1 1/4"*
Breite der Schneide / largeur du tranchant / anchura del filo / width of edge	125 mm *5"*	130 mm *5 1/8"*
Gewicht / poids / peso / weight	900 g *32 ozs*	1000 g *35 ozs*

Packing: unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans les caisses.
Embalaje: libre en cajas.

TRADE MARK

123 A/2320

BOY SCOUT'S AXE. Smooth surface, heat treated edge. Delivered either fully polished or varnished.

HACHETTE DE BOY-SCOUT. Surface lisse, tranchant trempé. Est livrée soit entièrement polie, soit vernie. Manche enduite de vernis incolore.

PFADFINDERBEIL. Glatte Oberfläche. Schneide gehärtet. Wird entweder ganz poliert oder lackiert geliefert.

HACHUELA PARA EXPLORADORES. Superficie lisa, corte templado. Se suministra completamente pulido o barnizado. Mango barnizado con barniz transparente.

Höhe / hauteur / altura / height	400 mm *15 3/4"*
Gewicht / poids / peso / weight	550 g *19 1/4 ozs*

TRADE MARK

124 A/2317

FIREMAN'S AXE. Made of high quality steel. The edge and the point is ground up to one third, and coated with transparent lacquer; the rest of the axe surface is black varnished. Delivered with polished shaft of ash-tree wood, provided with two keys in the axe hole. For fire brigade members.

HACHE DE POMPIER en acier de bonne qualité. Le tranchant et la pointe jusqu'à ⅓ de sa longueur sont moulés et enduite de vernis incolore, le reste de la surface de la hache est enduit de vernis noir. La hache est fournie avec manche en bois de frêné poli, muni, dans l'oeil de la hache, de deux languettes. Pour membres des corps de sapeurs-pompiers.

FEUERWEHRHACKE, aus Qualitätsstahl, Schneide und Spitze bis zu einem Drittel der Länge geschliffen und mit farblosem Lack angestrichen, die übrige Oberfläche mit Eisenlack schwarz lackiert. Wird mit poliertem Stiel aus Eschenholz mit zwei Federn in der Öffnung geliefert. Für Angehörige der Feuerwehr.

HACHA PARA BOMBEROS. De acero de calidad. Filo y pico hasta ⅓ cepillado y barnizado con barniz transparente. Superficie restante de hacha barnizada en negro. Se suministran con mango de fresno pulido equipado de dos resortes en el ojo de hacha. Para miembros de grupo de bomberos.

Höhe / hauteur / altura / height	340 mm *13 3/8"*
Breite der Schneide / largeur du tranchant / anchura del filo / width of edge	115 mm *4 1/2"*
Gewicht / poids / peso / weight	2400 kg *5/5 lbs*

Packing: unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans les caisses.
Embalaje: libre en cajas.

125 A/302

DEMOLITION FIREMAN'S AXE. Heat-treated at both ends. The axe surface finely polished. The shaft is secured in the axe hole by 2 safety keys. Smooth shaft, coated with transparent lacquer.

HACHE DE POMPIER À DEMOLIR. Trempée sur les deux cotés. Surface de la hache finement polie. Dans l'oeil de la hache, le manche est assurée par deux languettes. Manche lisse et enduite de vernis incolore.

FEUERWEHR-DEMOLIERHACKE, an beiden Enden gehärtet, Oberfläche fein poliert. In der Öffnung ist der Stiel mit 2 Federn gesichert. Glatter Stiel, mit farblosem Lack angestrichen.

HACHA DE BOMBEROS PARA DERRIBAR. Ambos extremos templados. Superficie del hacha pulida. El mango esta asegurado en el ojo con dos resortes de fijacion. Mango liso, barnizado con barniz transparente.

Höhe / hauteur / altura / height	340 mm *13 3/8"*
Breite der Schneide / largeur du tranchant / anchura del filo / width of edge	115 mm *4 1/2"*
Gewicht / poids / peso / weight	1,95 kg *4/3 1/2 lbs*

Packing: unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans les caisses.
Embalaje: libre en cajas.

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SPECIAL AXES · SONDERBEILE · HACHES SPECIALES HACHAS ESPECIALES

126 A/1841 — 126 A/1842

TUMBA I and II AXE. Made of high quality steel, the edge heat-treated and ground, the surface varnished. The shaft coated with transparent lacquer.

BEIL „TUMBA" I und II. Aus Qualitätsstahl, Schneide gehärtet und geschliffen, Oberfläche lackiert. Stiel mit farblosem Lack angestrichen.

HACHE "TUMBA" I ET II. En acier de bonne qualité, tranchant trempé et poli surface vernie, manche enduite de vernis incolore.

HACHA TUMBA I y II, de acero de calidad, filo templado y cepillado, superficie barnizada. Mango barnizado con barniz transparente.

	TUMBA I	TUMBA II			
Höhe / hauteur altura height	52 mm *2 1/16"*	55 mm *2 3/16"*	55 mm *2 3/16"*	67 mm *2 5/8"*	62 mm *2 7/16"*
Länge / longueur longitud length	650 mm *26"*	650 mm *26"*	700 mm *28"*	800 mm *32"*	750 mm *30"*
Breite der Schneide / largeur du tranchant / anchura del filo width of edge	104 mm *4 1/8"*	107 mm *4 1/4"*	112 mm *4 3/8"*	126 mm *5"*	118 mm *4 5/8"*
Gewicht / poids peso weight	2,– *2/8*	3,– *3/8*	4,– *4/8*		lbs

Packing: unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans les caisses.
Embalaje: libre in cajas.

TRADE MARK

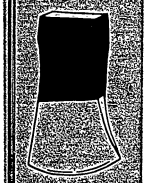
127 A/1845

YANKEE AXE. Made of heigh quality steel, the edge heat-treated and ground, the surface varnished.

BEIL „YANKEE". Aus Qualitätsstahl, Schneide gehärtet und geschliffen, Oberfläche lackiert.

HACHE "YANKEE". En acier de bonne qualité, tranchant trempé et poli surface vernie.

HACHA YANKEE. De acero de calidad, filo templado y cepillado, superficie barnizada.



Höhe / hauteur altura height	52 mm *2 1/16"*	55 mm *2 1/16"*	55 mm *2 3/16"*	62 mm *2 7/16"*	67 mm *2 5/8"*
Länge / longueur longitud length	650 mm *26"*	650 mm *26"*	700 mm *28"*	750 mm *30"*	800 mm *32"*
Breite der Schneide / largeur du tranchant / anchura del filo width of edge	89 mm *3 1/2"*	93 mm *3 5/8"*	95 mm *3 3/4"*	102 mm *4"*	110 mm *4 11/16"*
Gewicht / poids peso weight	*2*	*2/8*	*3*	*3/8*	*4* lbs

Packing: unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans les caisses.
Embalaje: libre en cajas.

TRADE MARK

128 A/1843

BAHIA AXE. Made of high quality steel, the edge heat-treated and ground, the surface varnished.

BEIL „BAHIA". Aus Qualitätsstahl, Schneide gehärtet und geschliffen, Oberfläche lackiert.

HACHE "BAHIA". En acier de bonne qualité, tranchant trempé et poli, surface vernie.

HACHA BAHIA. De acero de calidad, corte templado y cepillado. Superficie barnizada.

Höhe / hauteur altura height	52 mm *2 1/16"*	55 mm *2 3/16"*	55 mm *2 3/16"*	62 mm *2 7/16"*	67 mm *2 5/8"*
Länge / longueur longitud length	650 mm *26"*	650 mm *26"*	700 mm *28"*	750 mm *30"*	800 mm *32"*
Breite der Schneide / largeur du tranchant / anchura del filo width of edge	106 mm *4 3/16"*	112 mm *4 3/8"*	116 mm *4 9/16"*	121 mm *4 3/4"*	130 mm *5 1/8"*
Gewicht / poids peso weight	*2*	*2 1/2*	*3*	*3 1/2*	*4* lbs

TRADE MARK

129 A/1844

PERNAMBUKO AXE. Made of high quality steel, the edge heat-treated and ground, the surface varnished.

BEIL „PERNAMBUKO". Aus Qualitätsstahl, Schneide gehärtet und geschliffen, Oberfläche lackiert.

HACHE "PERNAMBUCO". En acier de bonne qualité, tranchant trempé et poli, surface vernie.

HACHA PERNAMBUCO. De acero de calidad, corte templado y cepillado, superficie barnizada.

Höhe / hauteur altura height	52 mm *2 1/16"*	55 mm *2 3/16"*	55 mm *2 3/16"*	62 mm *2 7/16"*	67 mm *2 5/8"*
Länge / longueur longitud length	650 mm *26"*	650 mm *26"*	700 mm *28"*	750 mm *30"*	800 mm *32"*
Breite der Schneide / largeur du tranchant / anchura del filo width of edge	75 mm *3"*	82 mm *3 1/4"*	89 mm *3 1/2"*	95 mm *3 3/4"*	99 mm *3 7/8"*
Gewicht / poids peso weight	*2*	*2 1/2*	*3*	*3 1/2*	*4* lbs

TRADE MARK

MOTOKOV · PRAHA · CZECHOSLOVAKIA

A

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TONGS · ZANGEN · TENAILLES ET PINCES · PINZAS Y TENAZAS

140 A/304

SHOULDERED PINCERS. The edge heat-treated, the head fine ground. Smooth surface, black or blue varnished.

TENAILLES. Tranchants trempés, tête finement polie. Surface lisse, enduite de vernis noir ou bleu.

BEISSZANGEN. Schneide gehärtet, Kopf fein geschliffen, Oberfläche glatt, mit schwarzem oder blauem Lack angestrichen.

TENAZAS PARA CLAVOS. Filo templado, cabeza finamente cepillada. Superficie lisa, barnizada en negro o en azul.

Länge / longueur			
longitud	150 mm	200 mm	250 mm
length	6"	8"	10"
Gewicht / poids			
peso	200 g	380 g	380 g
weight	7 ozs	12 5/8 ozs	20 3/8 ozs

Packed: in cardboard-boxes containing 6 — 12 pieces each.
Verpackung: in Pappschachteln je 6—12 Stück.
Emballage: en boîtes de carton par 6—12 pièces.
Embalaje: en cajas de cartón a 6—12 piezas.

TRADE MARK

141 A/347

COMBINATION PLIERS. Bevelled jaws.

PINCE UNIVERSELLE NON ISOLÉE. Carrées, mâchoires à méplat.

NICHTISOLIERTE KOMBINATIONSZANGE. Abgeschrägte Backen.

PINZAS UNIVERSALES NO AISLADOS. Boca biselada chata.

Länge / longueur	
longitud	180 mm
length	7 1/8"
Gewicht / poids	
peso	270 g
weight	9 1/2 ozs

Packed:
in cardboard-boxes containing 6 pieces each.
Verpackung: je 6 Stück in Schachteln.
Emballage: en boîtes per 6 pièces.
Embalaje: a 6 piezas en una cajita.

TRADE MARK

142 A/348

COMBINATION PLIERS, SPECIAL TYPE. The edges heat-treated. Surface free of sharp edges, black or blue varnished. Ground head. The pliers also produced in finer execution, partly and fully polished.

NICHTISOLIERTE KOMBINATIONSZANGE, SPEZIALTYPE. Schneide gehärtet. Oberfläche ohne scharfe Kanten, mit schwarzem oder blauem Lack angestrichen, Kopf geschliffen. Diese Zangen werden auch in feinerer Ausführung, teilweise oder ganz poliert, hergestellt.

PINCE UNIVERSELLE NON ISOLÉE MODÈLE SPÉCIAL. Tranchants trempés. Surface sans arêtes vives, enduite de vernis noir ou bleu. Tête finie à moule. La pince est fabriquée aussi en présentation plus fine, partiellement ou entièrement polie.

PINZAS UNIVERSALES NO AISLADOS. MODELO ESPECIAL. Corte templado. Superficie sin cantos vivos, barnizados en negro o en azul. Cabeza cepillada. Los alicates se ejecutan también en ejecución más fina, por partes o totalmente pulidos.

Länge / longueur		
longitud	180 mm	225 mm
length	7 1/8"	8 7/8"
Gewicht / poids		
peso	270 g	506 g
weight	9 1/2 ozs	17 3/4 ozs

Packed in cardboard-boxes containing 6 pieces each, wrapped in oil paper.
Verpackung: in Pappschachteln je 6 Stück, durchlegt mit Ölpapier.
Emballage: en boîte de carton a 6 pièces, chaque pièce emballée dans papier gras.
Embalaje: en cajas de cartón a 6 piezas empaquetadas en papel engrasado.

142 A/349

With chequered handles.

Avec manches carrées.

Mit Kanerten Schenkeln.

Con mangos estriados.

TRADE MARK

143 A/352

INSULATED COMBINATION PLIERS. The edges heat-treated, smooth surface, black or blue varnished. Head finely ground. The handles are clad in rubber or polyvinyl chloride insulation. Used mainly in electrical engineering.

ISOLIERTE KOMBINATIONSZANGE. Schneide gehärtet, Oberfläche glatt, mit schwarzem oder blauem Lack angestrichen. Kopf fein geschliffen. Auf den Schenkeln sind Gummiisolierhüllen oder Isolierhüllen aus Polyvinylchlorid aufgezogen. Verwendung hauptsächlich in der Elektrotechnik.

PINCE UNIVERSELLE ISOLÉE. Tranchants trempés, surface lisse, enduite de vernis noir et bleu. Tête finement polie. Manches pourvues de garnitures isolantes en caoutchouc ou en chlorure de polyvinyle. Employée surtout dans l'électrotechnique.

PINZAS UNIVERSALES CON PIERNAS AISLADAS. Filo templado. Superficie sin cantos vivos, lisa, barnizada en negro o en azul. Cabeza finamente cepillada. Con piernas provistas de capas de goma o aisladores. Especialmente para el uso en la electrotécnica.

Länge / longueur		
longitud	180 mm	225 mm
length	7 1/8"	8 7/8"
Gewicht / poids		
peso	335 g	672 g
weight	11 3/4 ozs	23 1/2 ozs

Packed in cardboards-boxes containing 6 pieces each, wrapped in oil paper.
Verpackung: in Pappschachteln je 6 Stück, durchlegt mit Ölpapier.
Emballage: en boîte de carton par 6 pièces; chaque pièce emballée dans papier gras.
Embalaje: en cajas de cartón a 6 piezas empaquetadas en papel engrasado.

TRADE MARK

144 A/292

LEVER CUTTING NIPPERS for hard wire. The edges heat-treated, the head on the jaw front surface polished the surface of the nippers smooth, black or blue varnished. Used for cutting steel wire up to a tensile strength of 50 kgs/sq. mm and wire diameter 1,2—3 mm and wire of a maximum tensile strength of 200 kgs/sq. mm and wire diameter 2 mm.

HEBELVORSCHNEIDER für harten Draht. Schneide gehärtet, der Kopf an der vorderen Backenfläche poliert, Oberfläche glatt, mit schwarzem oder blauem Lack angestrichen. Verwendung: zum Schneiden von Stahldrähten bis zur Festigkeit von 50 kg/mm² bei Drahtstärke von 1,2—3 mm und von Drähten bis zur Festigkeit von max. 200 kg/mm² bis zur Drahtstärke von 2 mm.

PINCE COUPANTE ARTICULÉE pour fils de fer dura. Tranchants trempés, surfaces antérieure des mâchoires polies, surface de la pince lisse, enduite de vernis noir ou blou. Pour couper les fils en acier de 1,2—3 mm d'une résistance max. de 50 kg/mm² et des fils jusqu' à 2 mm d'une résistance max. de 200 kg/mm².

PINZAS CORTA-ALAMBRES ARTICULADAS para alambre duro. Filo templado, cabeza sobre área delantera de boca pulida, superficie lisa, barnizada en negro o en azul. So usan para cortar alambres de acero hasta 50 kg/mm² de resistencia de un espesor do 1,2—3 mm y de alambres de resistencia do 200 kg/mm² hasta un espesor de 2 mm.

Länge / longueur		
longitud	180 mm	200 mm
length	7 1/8"	12"
Gewicht / poids		
peso	380 g	520 g

Packing: each piece wrapped in oil paper a 5 pieces in a paper package.
Verpackung: je 1 Stück in Ölpapier und je 5 Stück in Papierpäckchen.
Emballage: par 1 pièce dans papier gras et par 5 pièces dans des paquets en papier.
Embalaje: a una pieza en papel engrasado y a 5 piezas en paquete de papel.

TRADE MARK

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145 A/310

CUTTING NIPPERS the hard wire. The sides heat-treated, the face surfaces polished and the rest black or blue varnished.

PINCE COUPANTE DE DIAMANT POUR FILS DE FER DURS. Mandibules trempées, surfaces extérieures des mâchoires polies, restes vernis noir ou bleu.

SEITENSCHNEIDER für harten Draht. Schneideflächen, Stirnfläche poliert und übrige Oberfläche mit schwarzem oder blauem Lack angestrichen.

PINZAS CON CORTE AL FRENTE para alambres duros. Filo templado, área de la frente pulida y superficie restante barnizada en negro o en azul.

Packed in cardboard-boxes containing 6 pieces each, wrapped in oil paper.

Verpackung: in Pappschachteln je 6 Stück, durchgelegt mit Ölpapier.

Emballage: en boîtes de carton par 6 pièces; chaque pièce dans du papier gras.

Embalaje: en cajas de cartón a 6 piezas envueltas en papel engrasado.

Länge / longueur longitud length	150 mm 6"
Gewicht / poids peso weight	350 g 8 1/2 ozs

TRADE MARK

146 A/305

WIRE CUTTING PLIERS, made of chrome-vanadium steel, fully polished. The working surfaces are heat-treated.

PINCE COUPANTE POUR FILS DE FER, en acier au chrome-vanadium, entièrement polie. Les surfaces travaillantes sont trempées.

DRAHTSCHNEIDER aus Chrom-Vanadium-Stahl, ganz poliert. Für Uhrmacher und Feinmechaniker.

PINZAS CORTA-ALAMBRE de acero cromo al vanadio, completamente pulidas. Para relojeros y mecánicos de precisión.

Packing: each piece in a cardboard-box.

Verpackung: je 1 Pappschachtel je 1 Stück.

Emballage: en boîtes de carton, par 12 pièces.

Embalaje: en cajas de cartón a una pieza.

Länge / longueur longitud length	125 mm 5"
Gewicht / poids peso weight	220 g 8 1/2 ozs

TRADE MARK

147 A/335

SIDE CUTTING PLIERS of chrome-vanadium steel. Heat-treated edges, polished head, smooth surface. Black or blue varnished.

PINCE COUPANTE DE CÔTÉ pour fils courbes. Tranchants trempés, tête polie, surface lisse, enduite de vernis noir ou bleu.

SEITENSCHNEIDER für weichen Draht. Schneidegehärtet, Kopf poliert, Oberflächeglatt, mit schwarzem oder blauem Lack angestrichen.

PINZAS CON CORTE DE COSTADO para alambre blando. Filo templado, cabeza pulida. Superficie lisa, barnizada en negro o en azul.

Packed in cardboard-boxes containing 6 pieces each, wrapped in oil paper.

Verpackung: je 6 Stück, durchgelegt mit Ölpapier.

Emballage: en boîte de carton par 6 pièces, chaque pièce emballée dans du papier gras.

Embalaje: en cajas de cartón a 6 piezas envueltas en papel engrasado.

Länge / longueur longitud length	150 mm 6"
Gewicht / poids peso weight	140 g 4 7/8 ozs

TRADE MARK

148 A/280 strong type / stärkere Gattung / modèle robuste / clase fuerte

148 A/288 smaller type / schwächere Gattung / modèle moins robuste / clase menos fuerte

GAS TUBE CONE PLIERS. The working surface of the jaws is heat-treated. The rest is smooth, black or blue varnished, the head polished. Applied for holding tubes in installation work. The smaller type is used in bicycle and car assembling.

GASROHRZANGE, Arbeitsflächen der Backen gehärtet, übrige Oberfläche glatt, mit schwarzem oder blauem Lack angestrichen, Kopf poliert. Verwendung: zum Halten von Rohren bei Installationsarbeiten. Die schwächere Gattung wird bei Fahrrad- und Kraftwagen-Montagen verwendet.

PINCE POUR TUBES. Les surfaces travaillantes des mâchoires sont trempées, le reste de la surface est lisse et enduite de vernis noir ou bleu; tête polie. Employée pour maintenir les tubes dans les travaux d'installation; le modèle moins robuste est employé au montage des vélos et des autos.

TENAZAS PARA TUBOS, áreas de trabajo de bocas templadas. Superficie restante lisa, barnizada en negro o en azul, cabeza pulida. Se usan para sujetar los tubos durante el trabajo de instalación. Clase menos fuerte se usa para montaje de bicicletas y automoviles.

	280	288	
Länge longueur longitud length	250 mm 10"	200 mm 8"	250 mm 10"
Gewicht poids / peso weight	450 g 16 ozs	170 g 6 ozs	430 g 15 ozs

Packing: in cardboard-boxes containing 6—12 pieces each, wrapped in oil paper.

Verpackung: in Pappschachteln je 6—12 Stück, durchgelegt mit Ölpapier.

Emballage: en boîtes de carton par 6—12 pièces; chaque pièce dans du papier gras.

Embalaje: en cajas de carton 6—12 piezas empaquedas en papel engrasado.

TRADE MARK

149 A/357

WATER PUMP PLIERS, TYPE SIKO, ADJUSTABLE. Made of chrome-vanadium steel. The jaw toothed parts are heat-treated, smooth surface except for the chequered handles, polished heads. Both parts of the pliers are linked by a steel, case hardened bolt. The adjustment is carried out by relative rotation of one part and by moving in the recess of the other. Used to advantage in car and bicycle assembling, installation work etc.

VERSTELLBARE WASSERPUMPENZANGE „SIKO" aus Chrom-Vanadium-Stahl. Gezähnte Backenteile gehärtet. Oberfläche glatt, ausgenommen die aufgerauhten Schenkel. Köpfe poliert. Beide Zangenteile sind mittels zementierter Stahlschraube verbunden. Das Verstellen erfolgt durch entsprechendes Drehen eines Teiles und durch Verschieben des anderen Zangenteiles. Vorteilhafte Verwendung bei Kraftwagen-, Fahrradmontagen, Installationsarbeiten usw.

PINCE MULTIPRISES „SIKO", en acier au chrome-vanadium. Les parties dentées des machoires sont trempées. Surface lisse (excepté les poignées qui sont rugueuses), têtes polies. Les deux parties de la pince sont reliées par une vis en acier cimentée. Le réglage se fait, en tournant une partie de la pince et en la poussant dans l'évidement de l'autre partie. Employée avec succès au montage des autos, des vélos, des tuyauteries etc.

TENAZAS PARA BOMBAS DE AGUA AJUSTABLES, „SIKO", de acero cromo al vanadio. Partes de bocas dentadas templadas, superficie lisa excepcionalmente piornas estiradas, cabeza pulida. Ambos piezas son unidas con tornillo de acero cementodo. Reajuste de las tenazas se ejecuta girando una pieza y deslizándola en la abertura de otra pieza de la tenaza. Uso ventajoso para el montaje de automoviles, bicicletas, instalaciones y otras.

Länge / longueur longitud length	240 mm 9 1/2"	370 mm 14 1/2"
Gewicht / poids peso weight	230 g 8 1/4 ozs	355 g 12 1/2 ozs

Packed in cardboard-boxes or paper packages containing 12 pieces each.

Verpackung: je 12 Stück in Pappschachteln oder Papierstückchen.

Emballage: en boîte de carton ou en paquet de papier par 12 pièces.

Embalaje: En cajas de cartón o en paquetes de papel a 12 piezas.

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150 A/3004

FLAT NOSE PLIERS. Made of chrome-vanadium steel, fully polished.

PINCE À BECS PLATS en acier au chrome-vanadium, entièrement poli.

FLACHZANGE aus Chrom-Vanadium-Stahl, ganz poliert.

PINZAS DE BOCA CHATA, de acero cromo al vanadio, completamente pulidas.

Länge / longueur	
longitud	135 mm
length	5 3/8"
Gewicht / poids	
peso	80 g
weight	2 3/4 ozs

Packing: each piece in a cardboard-box.
Verpackung: je 1 Stück in Pappschachteln.
Emballage: en boîte de carton par 1 pièce.
Embalaje: en caja de cartón a una pieza.

151 A/3007

PARALLEL FLAT NOSE PLIERS. Pressed of sheet steel, forged jaws, polished and nickel plated. For watchmakers and fine mechanics.

PINCE À BECS PLATS PARALLÈLES, en tôle d'acier gressé, becs forgés, nickelés. Pour horlogers et mécaniciens de précision.

PARALLELFLACHZANGE, aus Stahlblech gepreßt, Backen geschmiedet, poliert und vernickelt. Für Uhrmacher und Feinmechaniker.

PINZAS DE BOCA CHATA PARALELOS, prensados de hojalata de acero, bocas herradas, pulidas y niqueladas. Para relojeros y mecánicos de precisión.

Länge / longueur	
longitud	135 mm
length	5 3/8"
Gewicht / poids	
peso	80 g
weight	2 3/4 ozs

Packing: each piece in a cardboard-box.
Verpackung: je 1 Stück in Pappschachteln.
Emballage: en boîte de carton par 1 pièce.
Embalaje: En cajas de cartón a una pieza.

152 A/3006

ROUND NOSE PLIERS made of chrome-vanadium steel, fully polished.

PINCE À BECS RONDS en acier au chrome-vanadium, entièrement polie.

RUNDZANGE aus Chrom-Vanadium-Stahl, ganz poliert.

PINZAS DE BOCA REDONDA, de acero cromo al vanadio, completamente pulidas.

Länge / longueur	
longitud	130 mm
length	5 1/8"
Gewicht / poids	
peso	80 g
weight	2 3/4 ozs

Packing: each piece in a cardboard-box.
Verpackung: je 1 Stück in Pappschachteln.
Emballage: en boîte de carton par 1 pièce.
Embalaje: En caja de cartón a una pieza.

153 A/3050

HALF ROUND PLIERS, made of chrome-vanadium steel, fully polished. For watch-makers and fine mechanics.

PINCE À BECS PLATS DEMI-RONDS, en acier au chrome-vanadium, entièrement poli. Pour horlogers et mécaniciens de précision.

SPITZE FLACHZANGE aus Chrom-Vanadium-Stahl, ganz poliert. Für Uhrmacher und Feinmechaniker.

PINZAS CHATAS Y PUNTIAGUDAS de acero cromo al vanadio, completamente pulidas. Para relojeros y mecánicos de precisión.

Länge / longueur	
longitud	130 mm
length	5 1/8"
Gewicht / poids	
peso	80 g
weight	2 3/4 ozs

Packing: each piece in a cardboard-box.
Verpackung: in Pappschachteln je 1 Stück.
Emballage: en boîte de carton par 1 pièce.
Embalaje: En caja de cartón a una pieza.

154 A/320 flat nose / mit flachen Backen / à becs plats / con bocas chatas
154 A/322 round nose / mit runden Backen / à becs ronds / con bocas redondas

LONG NOSE WIRE PLIERS. The nose heat-treated, smooth surface, black or blue varnished, polished head. For assembly purposes.

PINCE POUR FILS DE FER À BECS LONGS. Becs trempés, surface lisse, enduite de vernis noir ou bleu. Pour travaux de montage.

DRAHTZANGE MIT LANGEN BACKEN, Backen gehärtet, Oberfläche glatt, mit schwarzem oder blauem Lack angestrichen, Kopf poliert. Für Montagearbeiten.

PINZAS PARA ALAMBRE CON BOCAS LARGAS, bocas templadas, superficie lisa, barnizada en negro o en azul, cabeza pulida. Para montaje.

Länge / longueur	
longitud	160 mm
length	6 3/8"
Gewicht / poids	
peso	120 g
weight	4 1/4 ozs

Packed in cardboard-boxes containing 12 pieces each.
Verpackung: in Pappschachteln je 12 Stück.
Emballage: en boîte de carton par 12 pièces.
Embalaje: En cajas de cartón a 12 piezas.

TRADE MARK

155 A/317 flat nose / mit flachen Backen / à becs plats / con bocas chatas
155 A/318 round nose / mit runden Backen / à becs ronds / con bocas redondas

WIRE PLIERS. The nose heat-treated, smooth surface, black or blue varnished, polished head. For assembly purposes.

PINCE POUR FILS DE FER. Becs trempés, surface lisse, enduite de vernis noir ou bleu. Pour travaux de montage.

DRAHTZANGE. Backen gehärtet, Oberfläche glatt, mit schwarzem oder blauem Lack angestrichen, Kopf poliert. Für Montagearbeiten.

PINZAS PARA ALAMBRE. Bocas templadas, superficio lisa, barnizada en negro o en azul, cabeza pulida. Para montaje.

	317	318
Länge / longueur		
longitud	150 mm	150 mm
length	5 7/8"	5 7/8"
Gewicht / poids		
peso	160 g	150 g
weight	5 5/8 ozs	5 1/4 ozs

Packed in cardboard-boxes containing 12 pieces each.
Verpackung: in Pappschachteln je 12 Stück.
Emballage: en boîte de carton par 12 pièces.
Embalaje: En cajas de cartón a 12 piezas.

TRADE MARK

156 A/793

TYPE NOVA TUBE BENDING PLIERS. Patented.

PINCE À COURBER LES TUBES BREVETÉE "NOVA".

ROHRBIEGEZANGE, Pat. „NOVA".

TENAZAS PARA ENCORVAR TUBAS patente "NOVE".

Länge / longueur								
longitud	7 mm	9 mm	11 mm	13,5 mm	16 mm	23 mm	29 mm	36 mm
length	9/32"	3/8"	7/16"	17/32"	5/8"	29/32"	1 1/8"	1 3/8"
Gewicht								
poids / peso	275 g	350 g	425 g	500 g	625 g	760 g	813 g	940 g
weight	9 5/8	12 3/8	15	17 5/8	22	26 1/2	28 5/8	33 1/8 ozs

TRADE MARK

Packing: each piece separately.
Einzelverpackung.
Emballage: par une pièce.
Embalaje: particular.

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157 A/330

PLIERS FOR FINE MECHANICS, finely polished.

PINCE POUR MÉCANICIENS DE PRÉCISION, finement polie.

FEINMECHANIKERZANGE, blank poliert.

PINZAS PARA MECÁNICOS DE PRECISIÓN, finamente pulidas.

Länge / longueur / longitud / length: 130 mm / 5 1/8"

Gewicht / poids / peso / weight: 120 g / 4 5/8 ozs

Packing: 6 pieces per package.
Verpackung: je 6 Stück.
Emballage: par 6 pièces.
Embalaje: a 6 piezas.

TRADE MARK

158 A/345

NEEDLE NOSE PLIERS, finely polished.

PINCE À BEC PLATS LONGS, finement polie.

NADELZANGE, blank poliert.

PINZAS A BOCA APUNTADA, finamente pulidas.

Länge / longueur / longitud / length: 180 mm / 7 1/8"

Gewicht / poids / peso / weight: 250 g / 8 7/8 ozs

Packing: 6 pieces per package.
Verpackung: je 6 Stück.
Emballage: par 6 pièces.
Embalaje: a 6 piezas.

TRADE MARK

159 A/464

NARROW FARRIER'S PINCERS.

PINCE DE MARÉCHAL FERRANT étroite.

SCHMALE HUFZANGE.

TENAZAS PARA HERRADORES, estrechas.

Länge / longueur / longitud / length: 320 mm / 12 5/8"

Gewicht / poids / peso / weight: 1250 g / 44 ozs

Packing: each piece separately.
Verpackung: je 1 Stück.
Emballage: par 1 pièce.
Embalaje: a 1 pieza.

TRADE MARK

160 A/1922

BEE KEEPER'S PLIERS, fine polished.

PINCE D'APICULTEUR, finement polie.

WABENZANGE, blank poliert.

PINZAS PARA APICULTORES, finamente pulidas.

Länge / longueur / longitud / length: 250 mm / 9 7/8"

Gewicht / poids / peso / weight: 500 g / 17 5/8 ozs

Packing: 6 pieces per package.
Verpackung: je 6 Stück.
Emballage: par 6 pièces.
Embalaje: a 6 piezas.

TRADE MARK

161 A/628

SHARPENED FARRIER'S PINCERS of fine quality material, polished jaws.

PINCE DE MARÉCHAL-FERRANT pour couper les sabots en acier de bonne qualité, mâchoires polies.

NIETAUSZIEHZANGE, aus Qualitätsstahl, fein gepolierte Backen.

TENAZAS PARA HERREROS para cortar cascos de caballo, de acero de calidad, bocas extendidas.

Länge / longueur / longitud / length: 350 mm / 13 3/4"

Gewicht / poids / peso / weight: 1570 g / 55 3/8 ozs

Packing: packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans la caisse.
Embalaje: libre en cajas.

TRADE MARK

162 A/135

LEAD TUBE ENLARGING PLIERS.

PINCE OUVRE-TUYAUX EN PLOMB.

BLEIROHRAUFWEITEZANGE.

TENAZAS PARA ENSANCHAR TUBOS DE PLOMO.

Länge / longueur / longitud / length: 240 mm / 9 1/2"

Gewicht / poids / peso / weight: 370 g / 13 ozs

Packing: packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans la caisse.
Embalaje: libre en cajas.

TRADE MARK

163 A/971

TINSMITH'S PLIERS.

PINCE DE FERBLANTIER.

SPENGLER-FALZZANGE.

TENAZAS PARA HOJALATEROS.

Länge / longueur / longitud / length: 260 mm / 10 1/4"

Gewicht / poids / peso / weight: 625 g / 22 ozs

Packing: packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans la caisse.
Embalaje: libre en cajas.

TRADE MARK

164 A/339

PIG TOOTH CLIPPING PINCERS. Forged of high quality steel, the edges heat-treated, smooth surface, black or blue varnished, polished head. For clipping young pigs teeth.

PINCE POUR COUPER LES DENTS DES COCHONS DE LAIT, forgée, en acier de bonne qualité, tranchants trempés, surface lisse, enduite de vernis noir ou bleu, tête polie.

FERKELZAHNZWICKZANGE. Aus Qualitätsstahl geschmiedet, Schneide gehärtet, Oberfläche glatt, mit schwarzem oder blauem Lack angestrichen, Kopf poliert. Zum Abzwicken von Ferkelzähnen.

PINZAS PARA DIENTES DE COCHINILLOS. De acero de calidad herradas, corte templado, superficie lisa, barnizado en negro o en azul, cabeza pulida. Para cortar dientes de puercos.

Länge / longueur / longitud / length: 130 mm / 5 1/8"

Gewicht / poids / peso / weight: 75 g / 2 5/8 ozs

Packing: 6 pieces wrapped in paper.
Verpackung: je 6 Stück.
Emballage: en paquet de papier par 6 pièces.
Embalaje: a 6 piezas.

TRADE MARK

165 A/528

SHOEMAKER'S PLIERS.

PINCE POUR CUIR DE CORDONNIER.

LEDERFALZZANGE.

PINZAS PARA CUERO DE ZAPATERO.

Länge / longueur / longitud / length: 200 mm / 8"

Gewicht / poids / peso / weight: 480 g / 17 ozs

Packing: 6 pieces per package.
Verpackung: je 6 Stück.
Emballage: par 6 pièces.
Embalaje: a 6 piezas.

TRADE MARK

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166 A/530

LEATHER PUNCH PLIERS, fully polished.
PINCE POUR CUIR DE SELLIERS, entièrement polie.

ZWICKLEDERZANGE, ganz poliert.
PINZAS PARA CUERO DE SELLERO. De perforar de acero.

Länge / longueur / longitud / length	200 mm 8"
Gewicht / poids / peso / weight	500 g 17 5/8 ozs

Packing: 5 pieces per package.
Verpackung: je 5 Stück.
Emballage: par 5 pièces.
Embalaje: a 5 piezas.

TRADE MARK

167 A/1700

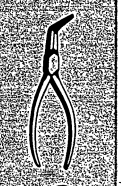
SAW SETTING PLIERS, forged of steel.
PINCE POUR TOURNER LES SCIES, entièrement forgée.

SCHRÄNKZANGEN, aus Stahl geschmiedet.
TENAZAS PARA TRABAJAR LAS SIERRAS, de acero.

Länge / longueur / longitud / length	170 mm 6 3/4"
Gewicht / poids / peso / weight	240 g 8 1/2 ozs

Packing: packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans la caisse.
Embalaje: libre en cajas.

TRADE MARK



168 A/346 A — 168 A/346 B

BENT JAW PLIERS.
PINCE À BECS COURBÉS.

STORCHSCHNABELZANGE.
PINZAS CON BOCA ENCORVADA.

	346 A	346 B
execution	bent sidewards	bent upwards
Ausführung	abseitsgebogen	aufwärtsgebogen
exécution	courbée à côté	courbée en haut
ejecución	encorvadas al costado	encorvadas hacia arriba

Packing: 6 pieces per package, or loose.
Verpackung: je 6 Stück oder lose.
Emballage: par 6 pièces ou en vrac dans des caisses.
Embalaje: á 6 piezas.

TRADE MARK

169 A/520

SHOEMAKER'S CUTTING PLIERS.
TENAILLES DE CORDONNIER.

SCHUSTERZWICKZANGE.
TENAZAS PARA ZAPATEROS.

Länge / longueur / longitud / length	200 mm 8"
Gewicht / poids / peso / weight	400 g 14 1/8 ozs

Packing: 6 pieces per package.
Verpackung: je 6 Stück.
Emballage: par 6 pièces.
Embalaje: a 6 piezas.

TRADE MARK

170 A/971 tinsmith's / für Spengler / pour ferblantiers / para hojalateros
170 A/972 riveted / aufgenietet / rivetées / remachadas
170 A/973 rammed / durchgesteckt / emmanchées / con pasador

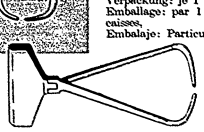
COVERING TINSMITH'S PLIERS. Forged, of steel.
TENAILLES DE FERBLANTIER POUR PLIER, en acier, forgées.

SPENGLER-DECKZANGE, aus Stahl geschmiedet.
TENAZAS PARA HOJALATEROS DE PLEGAR de acero, forjadas.

Länge / longueur / longitud / length	90 mm 3 1/2"	100 mm 4"	110 mm 4 3/8"	120 mm 4 3/4"	130 mm 5 1/8"	140 mm 5 1/2"	150 mm 5 7/8"	160 mm 6 3/8"

Packed: each piece separately or loose.
Verpackung: je 1 Stück oder lose.
Emballage: par 1 pièce ou en vrac dans des caisses.
Embalaje: Particular o una pieza.

TRADE MARK



171 A/

SEALING PLIERS for lead and acetate seals.
PINCE POUR SCELLER pour sceaux en plomb et en acétate.

PLOMBENZANGE für Blei- und Azotatplomben.
PINZAS PARA PRECINTAR para sellos de plomo o de acetato.

Size / Größe / grandeur / tamaños	540	541	541	542	542	543
Plombendurchmesser / diametro du sceau / diametro de sellos / Diameter of seal	8 mm 5/16"	9 mm 3/8"	11 mm 7/16"	8 mm 5/16"	14 mm 9/16"	16 mm 5/8"
Gewicht / poids / peso / Weight	300 g 10 1/2	300 g 10 1/2	300 g 10 1/2	300 g 10 1/2	600 g 21	600 g 21 ozs

Packing: packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans des caisses.
Embalaje: libre en cajas.

TRADE MARK

172 A/350

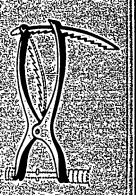
VALVE LIFTING PLIERS.
PINCE POUR SOUPAPES.

VENTILFEDERHEBEZANGE.
PINZAS PARA VÁLVULAS.

Gewicht / poids / peso / Weight	500 g 17 5/8 ozs

Packing: packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans des caisses.
Embalaje: libre en cajas.

TRADE MARK



173 A/558

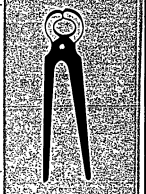
GLAZIER'S PLIERS.
PINCE DE VERRIER.

GLASERZANGE.
PINZAS DE VIDRIEROS.

Länge / longueur / longitud / Length	200 mm 8"
Gewicht / poids / peso / Weight	563 g 19 7/8 ozs

Packing: packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans des caisses.
Embalaje: libre en cajas.

TRADE MARK



174 A/137

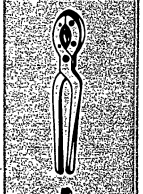
TUBE CUTTING PLIERS.
PINCE POUR COUPER LES TUYAUX EN PLOMB.

BLEIROHRSCHNEIDER.
TENAZAS PARA CORTAR TUBOS DE PLOMO.

Gewicht / poids / peso / Weight	700 g 24 5/8 ozs

Packing: 12 pieces per package.
Verpackung: je 12 Stück.
Emballage: par 12 pièces.
Embalaje: a 12 piezas.

TRADE MARK



175 A/60

FLAT BLACKSMITH'S FIRE TONGS.
TENAILLES DE FORGERON POUR LA MISE AU FEU, plates.

FEUERZANGE mit flachem Maul.
TENAZAS PARA FORJAR CON BOCA CHATA para introducir en el fuego.

Länge / longueur / longitud / Length	400 mm 16"	500 mm 20"	600 mm 24"
Gewicht / poids / peso / Weight	1000 g 35 ozs	1250 g 44 ozs	1400 g 55 ozs

Packing: per 12 pieces.
Verpackung: je 12 Stück.
Emballage: par 12 pièces.
Embalaje: a 12 piezas.

TRADE MARK

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176 A/61

ROUND BLACKSMITH'S FIRE TONGS.
TENAILLES DU FORGERON POUR LA MISE AU FEU, rondes.

FEUERZANGE mit rundem Maul.
TENAZAS PARA FORJAR CON BOCA REDONDA para introducir en el fuego.

Länge / longueur longitud / Length	400 mm 16"	500 mm 20"	600 mm 24"
Gewicht / poids peso / Weight	1000 g 35 ozs	1350 g 44 ozs	2400 g 85 ozs

Packing: per 10 pieces.
Verpackung: je 10 Stück.
Emballage: par 10 pièces.
Embalaje: a 10 piezas.

TRADE MARK

177 A/63

BLACKSMITH'S TOOTHED FIRE TONGS. (WOLF'S JAW TONGS.)
TENAILLE DE FORGERON POUR LA MISE AU FEU à gueule de loup.

WOLFSMAULZANGE.
TENAZAS PARA FORJAR CON BOCA DE LOBO para introducir en el fuego.

TRADE MARK

GRIP WRENCHES · ROHRZANGEN · PINCES POUR TUBES · LLAVES AJUSTABLES

188 A/246

UNIVERSAL PIPE WRENCH. The toothed surfaces are heat-treated, the bolt and joint nut turned, the bolt head polished, the rest black varnished. For installation work, for holding and tightening pipes.

PINCE POUR TUYAUX À ARTICULATION. Parties dentées trempées, boulon et écrou de l'articulation tournés, tête du boulon polie, reste de la surface verni noir. Employée aux travaux d'installation pour maintenir et serrer les tubes.

GELENKROHRZANGE. Gezahnte Flächen gehärtet, Schraube und Gelenkmutter gedreht, Schraubenkopf poliert, übrige Oberfläche schwarz lackiert. Für Installationsarbeiten zum Halten und Anziehen von Rohren.

TENAZA PARA TUBOS CON ARTICULACIÓN. Áreas dentadas templadas, tornillo y tuerca de articulación torneadas, cabeza del tornillo pulida. Superficie restante de la llave barnizada en negro. Para el trabajo de los fontaneros para sujetar y tirar los tubos.

Size up to Größe bis zu grandeur jusque à tamaño hasta (pulgadas)	1"	2"	3"	4"
Gesamtlänge der Rohrzange longueur totale de la pince longitud de la tenaza compl. Entire wrench length	380 mm 15"	510 mm 20"	700 mm 27 1/2"	845 mm 33"
Schraubenlänge / longueur du boulon longitud del tornillo Length of bolt	350 mm 14"	420 mm 16 1/2"	600 mm 24"	800 mm 32"
Hakenlänge / longueur du crochet longitud del corchete Length of hook	180 mm 7 1/8"	185 mm 7 1/4"	245 mm 9 5/8"	300 mm 12"

TRADE MARK

Packing: each piece separately wrapped in paper.
Verpackung: in Papierpäckchen je 1 Stück.
Emballage: en paquets de papier par 1 pièce.
Embalaje: en paquetes de papel a una pieza.

189 A/245

QUICK-ADJUSTABLE SELF CLAMPING WRENCH. The toothed lining of the hook is riveted by means of 3 rivets and welded. The toothed part of the eccentric handle and the lining are heat-treated, the entire surface is blue varnished, the handle jaw polished. The wrench will loosen even old seized joints.

PINCES POUR TUYAUX À SERRAGE AUTOMATIQUE ET À RÉGLAGE RAPIDE. La garniture dentée du crochet est rivetée et soudée. La partie dentée du manche excentrique et la garniture sont trempées. Toute la surface est vernie bleu, la mâchoire de la poignée est polie. Cette pince permet de desserrer même des joints très anciens.

SCHNELLVERSTELLBARE SELBSTTÄTIGE ROHRZANGE. Gezahnter Halbeinsatz ist mit 3 Nieten angenietet und angeschweißt. Gezahnter Teil des exzentrischen Handgriffes und Einsatz sind gehärtet, die ganze Oberfläche blau lackiert und die Handgriffbacke poliert. Mit dieser Rohrzange werden auch veraltete Verbindungen locker gemacht.

TENAZA PARA TUBOS CON APRETATIÓN AUTOMÁTICA REAJUSTE RAPIDO. La imposición dentada del corchete está remachada con 3 remachos y soldada. La parte dentada del mango excéntrico y la imposición son templadas. Superficie completa barnizada en azul, mordaza del mango pulida. Con esta tenaza se aflojan las conexiones más anticuadas.

Size up to Größe grandeur jusqu'à tamaño hasta 1 pulgada	1"	2"
Rohrzangenlänge longueur de la pince longitud de la tenaza Length of wrench	373 mm 14 3/4"	
Länge des Klemmteiles der Rohrzange / longueur de la partie de serrage de la pince / longitud de parte de apretación Length of wrench gripping part	103 mm 4"	
Breite des Klemmteiles der Rohrzange / largeur de la partie de serrage de la pince / anchura de la parte de apretación de la tenaza Width of wrench gripping part	80 mm 3 1/8"	

TRADE MARK

Packing: each piece in paper bag.
Verpackung: je 1 Stück in Papierpäckchen.
Emballage: individuellement, en paquets de papier.
Embalaje: Particular en paquetes de papel.

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190 A/258

TYPE BLESK GRIP WRENCH. The wrench shell is made of sheet steel, the body of steel. The toothed lining is riveted with one rivet and welded to the gripping part of the shell. The working parts are heat-treated, the surfaces on the body head polished, the rest black, varnished.

ROHRZANGE „BLESK". Mantel der Rohrzange aus Stahlblech, Körper aus Stahl. Der Stahleinsatz ist mit einer Niete befestigt, gezahnt und im Klemmteil des Mantels angeschweißt. Die Arbeitsteile sind gehärtet, die Flächen auf dem Körperkopf sind poliert, die übrige Oberfläche ist schwarz lackiert.

PINCE POUR TUYAUX "BLESK". L'enveloppe de la pince est en tôle d'acier, le corps en acier. La garniture dentée d'acier est fixée par un rivet et soudée dans la partie de serrage des l'enveloppes. Les parties travaillantes sont trempées, les surfaces sur la tête du corps sont polies, le reste de la surface est vernie noire.

TENAZAS PARA TUBOS, MODELO BLESK. La envoltura de la tenaza está fabricada de hojalata de acero, cuerpo de acero. Imposición de acero, remachada con un remache, dentada y soldada en la parte de apretación de la envoltura. Partes de trabajo templadas, áreas de la cabeza del cuerpo pulidas, superficie restante barnizada en negro.

Länge / longueur / longitud / Length	250 mm / 10"	300 mm / 12"
Gewicht / poids / peso / Weight	640 g / 22 1/2 ozs.	976 g / 34 3/8 ozs.

Packed in cardboard boxes containing 6 pieces each.
Verpackung: in Pappschachteln je 6 Stück.
Emballage: en boites de carton par 6 pièces.
Embalaje: en cajas de cartón a 6 piezas.

TRADE MARK

191 A/259

TYPE ROLOBLESK GRIP WRENCH. The shell is made of sheet steel, the body of steel. The toothed steel lining is riveted with one rivet and welded to the gripping part of the shell. The working parts and the lining are heat-treated, the surfaces on the body head are polished and the rest of the wrench blank varnished.

ROHRZANGE „ROLOBLESK". Mantel aus Stahlblech, Körper aus Stahl. Der Stahleinsatz mit einer Niete befestigt, gezahnt und im Klemmteil des Mantels angeschweißt. Die Arbeitsteile und der Einsatz sind gehärtet, die Flächen auf dem Körperkopf sind poliert, und die übrige Oberfläche ist schwarz lackiert.

PINCE POUR TUYAUX "ROLOBLESK". Enveloppe en tôle d'acier, corps en acier. La garniture dentée d'acier est fixée par un rivet et soudée dans la partie de serrage de l'enveloppe. Les parties travaillantes et la garniture sont trempées, les surfaces sur la tête du corps sont polies, le reste de la surface est vernie noire.

TENAZAS PARA TUBOS, MODELO BLESK. Envoltura de hojalata de acero, cuerpo de acero. Imposición de acero, remachada, con un remache, dentada y soldada en la parte de apretación. Partes de trabajo y envoltura templadas, áreas de cabeza pulidas y la superficie restante de la llave está barnizada en negro.

Länge / longueur / longitud / Length	225 mm / 9"
Gewicht / poids / peso / Weight	525 g / 18 1/2 ozs.

Packet in cardboard boxes containing 6 pieces each.
Verpackung: in Pappschachteln je 6 Stück.
Emballage: en boites de carton par 6 pièces.
Embalaje: en cajas de cartón a 6 piezas.

TRADE MARK

LOCKSMITH'S CHISELS · SCHLOSSERMEISSEL · BURINS ET BEDANES · TAJADERAS PARA CERRAJEROS

200 A/100

FLAT COLD CHISELS. The edge is heat-treated, approximately 30 mm finely polished, the rest black or blue varnished. Intermediate sizes manufactured according to customer's requirements.

FLACHE SCHLOSSERMEISSEL. Schneide gehärtet, bis zur Entfernung von zirka 30 mm fein poliert. Die übrige Oberfläche ist mit schwarzem oder blauem Lack angestrichen. Auf Wunsch des Kunden werden auch Zwischenabmessungen erzeugt.

BURINS DE SERRURIER. Tranchant trempé, finement poli sur une longueur de 30 mm env. Le reste de la surface est enduit de vernis noir ou bleu. Sur désir, nous fournissons, les burins aussi en d'autres dimensions.

CINCELES PARA CERRAJEROS, PLANOS. Corte templado, hasta cca 30 mm pulido. Superficie restante barnizada en negro o en azul. Sobre pedido especial del cliente se fabrican también en entrediámetros.

Länge / longueur / longitud / Length	125 / 5"	150 / 6"	175 / 7"	200 / 8"	250 / 10"	300 / 12"	350 / 14"	400 / 16"	500 mm / 20"
Breite der Schneide / largeur du tranchant / ancho del corte / Width of edge	10 / 3/8"	15 / 5/8"	20 / 3/4"	25 / 1"	30 / 1 1/8"	30 / 1 1/8"	30 / 1 1/8"	30 / 1 1/8"	30 mm / 1 1/8"
Gewicht / poids / peso / Weight	127 / 4 1/2	170 / 6	195 / 6 7/8	285 / 10	512 / 18	723 / 25 1/2	845 / 30	1120 / 39 1/2	1700 g / 60 ozs

Packed in paper packages containing 6 or 12 pieces each.
Verpackung: in Papierpäckchen je 6 oder 12 Stück.
Emballage: en paquets de papier par 6 ou 12 pièces.
Embalaje: en paquetes de papel a 6 o 12 piezas.

TRADE MARK

201 A/105

CROSS CUT COLD CHISELS. The edge is heat-treated, approximately 30 mm finely polished. The rest black or blue varnished. According to customer's requirements the manufacture of other sizes can be arranged.

SCHLOSSERKREUZMEISSEL. Schneide gehärtet, bis zur Entfernung von 30 mm blank poliert. Übrige Oberfläche mit schwarzem oder blauem Lack angestrichen. Auf Wunsch des Kunden und nach Übereinkommen mit dem Erzeuger werden auch weitere Abmessungen hergestellt.

BÉDANES DE SERRURIER. Tranchant trempé, finement poli, sur une longueur de 30 mm env. Le reste de la surface est enduit de vernis noir ou bleu. Sur désir, nous fournissons, après l'entente avec le producteur, les bédanes aussi en d'autres dimensions.

CINCELES PARA CERRAJEROS, DE CORTE TRANVERSAL. Corte templado, hasta 30 mm pulido. Superficie restante está barnizada en negro o en azul. Sobre pedido especial después de acuerdo con el fabricante se ejecutan también otros diámetros.

Länge / longueur / longitud / Length	150 mm / 6"	200 mm / 8"	250 mm / 10"
Breite der Schneide / largeur du tranchant / ancho del corte / Width of ed,	5 mm / 3/16"	10 mm / 3/8"	9 mm / 11/32"
Gewicht / poids / peso / Weight	160 g / 5 5/8	200 g / 10 1/4	520 g / 18 3/8 ozs

Packed in paper packages containing 6 or 12 pieces each.
Verpackung: in Papierpäckchen je 6 oder 12 Stück.
Emballage: en paquets de papier par 6 ou 12 pièces.
Embalaje: en paquetes de papel a 6 o 12 piezas.

TRADE MARK

202 A/116

BREAKING CHISELS. For hot and cold working.

SCHROTMEISSEL. Zum Hacken in warmem oder kaltem Zustande.

TRANCHES POUR FER, pour couper à chaud ou à froid.

TAJADERAS PARA HIERRO FRÍO O CALIENTE.

Gewicht / poids / peso / Weight	1250 g / 44 ozs	1500 g / 53 ozs

Packing: packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans des caisses.
Embalaje: libre en cajas.

TRADE MARK

MOTOKOV PRAHA · CZECHOSLOVAKIA

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SCRAPERS · SCHABER · GRATTOIRS · RASPADORES

206 A/124

BEARING SCRAPERS. LAGERSCHABER.
GRATTOIRS POUR COUSSINETS. RASPADORES PARA COJINETES.

Länge ohne Heft longueur sans manche longitud sin mango Length without handle Gewicht / poids / peso Weight	100 mm 4" 100 g 3 1/2	125 mm 5" 130 g 4 1/2	150 mm 6" 145 g 5 1/8	200 mm 8" 160 g 5 5/8	250 mm 10" 200 g 7 ozs

TRADE MARK

Packing: each piece separately.
Verpackung: je 1 Stück.
Emballage: individuel.
Embalaje: particular.

207 A/123

HOLLOW TRIANGULAR SCRAPERS. DREIKANTIGE HOHLSCHABER.
GRATTOIRS TRIANGULAIRES, PROFILÉS. RASPADORES TRIANGULARES HUECOS.

Länge ohne Heft longueur sans manche longitud sin mango Length without handle Gewicht / poids / peso Weight	125 mm 5" 120 g 4 1/4	150 mm 6" 130 g 4 1/2	175 mm 7" 140 g 5	200 mm 8" 160 g 5 5/8 ozs

TRADE MARK

Packing: each piece separately.
Verpackung: je 1 Stück.
Emballage: individuel.
Embalaje: particular.

208 A/128

TRIANGULAR SCRAPERS. DREIKANTSCHABER.
GRATTOIRS TRIANGULAIRES, PLEINS. RASPADORES TRIANGULARES LLENOS.

Länge ohne Heft longueur sans manche longitud sin mango Length without handle Gewicht / poids / peso Weight	125 mm 5" 120 g 4 1/4	150 mm 6" 130 g 4 1/2	175 mm 7" 140 g 5	200 mm 8" 160 g 5 5/8 ozs

TRADE MARK

Packing: each piece separately.
Einzelverpackung.
Emballage: individuel.
Embalaje: particular.

209 A/129

BLUNT SCRAPERS. FLACHSCHABER.
GRATTOIRS PLATS. RASPADORES PLANOS.

Länge ohne Heft longueur sans manche longitud sin mango Length without handle Gewicht / poids / peso Weight	125 mm 5" 120 g 4 1/4	150 mm 6" 130 g 4 1/2	175 mm 7" 140 g 5	200 mm 8" 160 g 5 5/8 ozs

TRADE MARK

Packing: each piece separately.
Einzelverpackung.
Emballage: individuel.
Embalaje: particular.

PUNCHES · LEDERDURCHTREIBER · POINÇONS · SACABOCADOS

215 A/423

ROUND LEATHER PUNCHES. RUNDE LOCHEISEN.
EMPORTE-PIÈCES POUR CUIR, ronds. SACABOCADOS PARA CUERO, redondos.

Point diameter / Durchmesser des Dornes / diamètre de perçage / tamaño del diámetro de la abertura:

2 mm	3 mm	4 mm	5 mm	6 mm	7 mm	8 mm	9 mm	10 mm
5/64"	1/8"	5/32"	3/16"	1/4"	9/32"	5/16"	3/8"	13/32"
11 mm	12 mm	13 mm	14 mm	15 mm	16 mm	17 mm	18 mm	19 mm
7/16"	15/32"	1/2"	9/16"	19/32"	5/8"	11/16"	23/32"	3/4"
20 mm	21 mm	22 mm	23 mm	24 mm				
25/32"	13/16"	7/8"	29/32"	15/16"				

TRADE MARK

Packed in paper packages containing 12 pieces each.
Verpackung: in Papierpäckchen je 12 Stück.
Emballage: en paquets de papier par 12 pièces.
Embalaje: en paquetes de papel a 12 piezas.

216 A/426

BOW LEATHER PUNCHES. HENKELLOCHEISEN.
EMPORTE-PIÈCES POUR CUIR, À ÉTRIER. SACABOCADOS PARA CUERO, de puente.

Point diameter: from 1/4" to 3 1/8" / from 2" upwards in graduations of 3/16".
Durchmesser des Dornes: von 6 bis 80 mm / von 50 mm aufwärts in Abständen von 5 mm.
Diamètre de perçage: de 6 à 80 mm / à partir de 50 mm, les différences entre les perçages sont de 5 mm.
Tamaño del diámetro de la abertura: de 6 mm hasta 80 mm / de 50 mm la aumentación a 5 mm.

TRADE MARK

Packing: in paper packages containing 12 pieces each, larger pieces separately.
Verpackung: in Papierpäckchen je 12 Stück, größere Henkeldurchtreiber in Einzelverpackung.
Emballage: en paquets de papier par 12 pièces, les grands — individuellement.
Embalaje: en paquetes de papel a 12 piezas, piezas más grandes en particular.

CASE OPENERS · KISTENÖFFNER · CISEAUX A DEBALLER · ABRECAJAS

217 A/756

CASE OPENERS, 1 side flat, the other half round, made of high quality steel.

KISTENÖFFNER. Eine Seite flach, andere Seite halbrund, aus Qualitätsstahl.

CISEAUX À DEBALLER, un côté plat, l'autre creux demi-rond. En acier de bonne qualité.

HIERRO PARA DESEMBALAR. Una cara plana y la otra semiredonda, de acero de calidad.

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Centre Punches, Punches, Snap Head Dies Körner, Durchschläger und Nietenkopfsetzer Pointeaux, Poinçons, Chasse-Rivets, Bouterolles Punteros, Punzones, Remachadores

218 A/71

CENTRE PUNCHES, made of high quality steel, carefully heat-treated.

POINTEAUX en acier de bonne qualité, trempés avec soin.

KÖRNER aus Qualitätsstahl, sorgfältig gehärtet.

PUNTEROS de acero de calidad, templado cuidadoso.

Größe / grandeur / tamaño	100 × 10	110 × 12	120 × 14 mm
Size	*4" × 13/32"*	*4 3/8" × 15/32"*	*4 3/4" × 9/16"*
Gewicht / poids / peso	55 g	60 g	60 g
Weight	*1 15/16 ozs*	*2 1/8 ozs*	*2 1/8 ozs*

Packing: packages containing 12 pieces each
Verpackung: in Papierpäckchen je 12 Stück.
Emballage: en paquets par 12 pièces.
Embalaje: en paquetes de papel a 12 piezas.

TRADE MARK

219 A/795

RIVETING-SET
CHASSE-RIVETS

NIETENZIEHER.
SACAREMACHES.

Nietendurchmesser / diamètre des rivets / tamaño del diámetro de remaches:	2 *5/64"*	3 *1/8"*	4 *5/32"*	5 *3/16"*	6 *1/4"*	7 *9/32"*	8 *5/16"*	9 *3/8"*	10 mm *13/32"*
Rivet diameter									
Gewicht / poids / peso	35 g	40 g	50 g	60 g	75 g	105 g	150 g	200 g	240 g
Weight	*1 1/4*	*1 7/16*	*1 3/4*	*2 1/8*	*2 5/8*	*3 3/4*	*5 5/16*	*7*	*8 1/2 ozs*

Packing: packages containing 12 pieces each
Verpackung: in Papierpäckchen je 12 Stück
Emballage: en paquets par 12 pièces.
Embalaje: en paquetes a 12 piezas.

TRADE MARK

220 A/790

SNAP HEAD PUNCHES
BOUTEROLLES À MAIN

NIETENKOPFSETZER.
REMACHADORES manuales.

Nietendurchmesser / diamètre des rivets / tamaño del diámetro de remaches:	2 *5/64"*	3 *1/8"*	4 *5/32"*	5 *3/16"*	6 *1/4"*	7 *9/32"*	8 *5/16"*	9 *3/8"*	10 mm *13/32"*
Rivet diameter									
Gewicht / poids / peso	45	85	87	170	215	280	330	335	390 g
Weight	*1 1/2*	*3*	*3 1/16*	*6*	*7 1/2*	*9 13/16*	*11 5/8*	*11 13/16*	*13 3/4 ozs*

Packing: packages containing 12 pieces each
Verpackung: in Papierpäckchen je 12 Stück
Emballage: en paquets par 12 pièces.
Embalaje: en paquetes a 12 piezas.

TRADE MARK

SHEARS · SCHEREN · CISAILLES ET SECATEURS · TIJERAS

221 A/406

TINMEN SNIPS. Made of high quality steel, the cutting edges bright, the handles black varnished. For cutting sheet up to 0.8 mm / 1/32" / thick.

CISAILLES POUR TÔLE, en acier de bonne qualité, tranchants blanchis, poignées vernies noir. Pour couper des tôles jusqu'à 0,8 mm d'épaisseur.

BLECHSCHERE aus Qualitätsstahl, Schneidebacken blank, Handgriffe schwarz lackiert. Zum Blechschneiden bis zur Stärke 0,8 mm.

TIJERAS PARA HOJALATEROS de acero de calidad. Bocas cortantes afiladas, mangos barnizados en negro. Para cortar hojalata hasta 0,8 mm de espesor.

Länge / longueur / longitud	200 mm	250 mm	300 mm
Length	*8"*	*10"*	*12"*
Gewicht / poids / peso	450 g	550 g	900 g
Weight	*16 ozs*	*19 ozs*	*32 ozs*

Packed in cardboard-boxes containing 6 pieces each.
Verpackung: in Pappschachteln je 6 Stück.
Emballage: en boites de carton par 6 pièces.
Embalaje: en cajas de cartón a 6 piezas.

222 A/402

TINMEN SNIPS. Made of high quality steel, the cutting edges bright, the handles black varnished. For thin sheet cutting.

CISAILLE POUR TÔLE, en acier de bonne qualité, tranchants blanchis, poignées vernies noir. Pour couper des tôles de faible épaisseur.

BLECHSCHERE AUS QUALITÄTSSTAHL, Schneidebacken blank, Handgriffe schwarz lackiert. Zum Schneiden von schwachen Blechen.

TIJERAS PARA HOJALATEROS de acero de calidad. Bocas cortantes afiladas, mangos barnizados en negro. Para cortar hojalata fina.

Länge / longueur / longitud	200 mm
Length	*8"*
Gewicht / poids / peso	400 g
Weight	*14 ozs*

Packed in cardboard-boxes containing 6 pieces each.
Verpackung: in Pappschachteln je 6 Stück.
Emballage: en boites de carton par 6 pièces.
Embalaje: en cajas de cartón a 6 piezas.

223 A/412

TINMEN SNIPS. Made of high quality steel, bright cutting edges, the handles black varnished. For straight and hole sheet cutting up to 1 mm / 1/16" thick.

CISAILLE POUR TÔLE, en acier de bonne qualité, tranchants blanchis, poignées vernies noir. Pour couper des tôles jusqu'à 1 mm d'épaisseur en lignes droites ou courbées.

BLECHSCHERE aus Qualitätsstahl, Schneidebacken blank, Handgriffe schwarz lackiert. Zum geraden und runden Blechschneiden bis zur Stärke von 1 mm.

TIJERAS PARA HOJALATEROS de acero de calidad. Bocas cortantes afiladas, mangos barnizados en negro. Para cortar hojalata derechamente y de manera redonda hasta 1 mm de espesor.

Länge / longueur / longitud	275 mm
Length	*11"*
Gewicht / poids / peso	700 g
Weight	*25 ozs*

Packed in cardboard-boxes containing 6 pieces each.
Verpackung: in Pappschachteln je 6 Stück.
Emballage: en boites de carton par 6 pièces.
Embalaje: en cajas de cartón a 6 piezas.

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224 A/411

TINMEN SNIPS. Made of high quality steel, bright cutting edges, the handles black varnished, for hole cutting of sheet up to 1,2 mm / 3/32" thick.

CISAILLES POUR TÔLE, en acier de bonne qualité, tranchants blanchis, poignées vernies noir. Pour couper des tôles jusqu'à 1,2 mm d'épaisseur en lignes courbées.

BLECHSCHERE aus Qualitätsstahl, Schneidebacken blank, Handgriffe schwarz lackiert. Zum runden Blechschneiden bis zur Stärke 1,2 mm.

TIJERAS PARA HOJALATEROS de acero de calidad, Bocas cortantes afiladas, barnizadas en negro. Para cortar hojalata, hasta 1,2 mm de espesor de manera redonda.

Länge / longueur	411	411 B
longitud	250 mm	300 mm
Length	*10"*	*12"*
Gewicht / poids / peso	450 g	550 g
Weight	*16 ozs*	*19 ozs*

Packed in cardboard-boxes containing 6 pieces each.
Verpackung: in Pappschachteln je 6 Stück.
Emballage: en boîtes de carton par 6 pièces.
Embalaje: en cajas de cartón a 6 piezas.

225 A/840

PRUNING SHEARS, DOUBLE-EDGED. Forged of high quality steel, bright edges, the handles black varnished. For cutting thin twigs.

SÉCATEUR DE JARDINIER DOUBLE forgé en acier de bonne qualité, tranchants blanchis, poignées vernies noir. Pour couper les petites branches.

ZWEISCHNEIDIGE GARTENSCHERE, aus Qualitätsstahl geschmiedet, Backen blank, Handgriffe schwarz lackiert. Zum Abschneiden von schwächeren Ästen.

TIJERAS DE JARDINERO de dos cortes forjados de acero de calidad. Bocas cortantes afiladas, mangos barnizados en negro. Para cortar ramas tenues.

Länge / longueur / longitud	230 mm
Length	*9"*
Gewicht / poids / peso	450 g
Weight	*16 ozs*

Packed in cardboard-boxes containing 6 pieces each.
Verpackung: in Pappschachteln je 6 Stück.
Emballage: en boîtes de carton par 6 pièces.
Embalaje: en cajas de cartón a 6 piezas.

226 A/399

HOP WIRE CUTTERS forged of high quality steel, bright edges, the handles black varnished. For cutting wires in a hop-yard and for removing steel strips from cases.

CISAILLE POUR FILS DE FER À HOUBLON, forgées en acier de bonne qualité, tranchants blanchis, poignées vernies noir. Pour couper les fils de fer dans les houblonnières et pour enlever les bandes d'acier des caisses.

HOPFENDRAHTSCHERE, aus Qualitätsstahl geschmiedet, Backen blank, Handgriffe schwarz lackiert. Zum Drahtschneiden in Hopfengärten und zum Besaugen von Stahlbändern der Kisten.

TIJERAS PARA CORTAR ALAMBRE DE LÚPULO forjadas de acero de calidad. Bocas cortantes afiladas, mangos barnizados en negro. Para cortar alambre en lúpulares y para tirar cuntas de acero de los cajones.

Länge / longueur / longitud	200 mm
Length	*8"*
Gewicht / poids / peso	210 g
Weight	*7 3/8 ozs*

Packed in cardboard-boxes containing 6 pieces each.
Verpackung: in Pappschachteln je 6 Stück.
Emballage: en boîtes de carton par 6 pièces.
Embalaje: en cajas de cartón a 6 piezas.

227 A/834

VINE PRUNING SHEARS. Forged of high quality steel, bright edges, the handles black varnished.

SÉCATEUR DE JARDINIER POUR LA VIGNE, forgé en acier de bonne qualité, tranchants blanchis, poignées vernies noir.

REBENSCHERE, aus Qualitätsstahl geschmiedet. Backen blank, Handgriffe schwarz lackiert.

TIJERAS PARA VID, forjadas de acero de calidad. Bocas cortantes afiladas, mangos barnizados en negro.

Länge / longueur / longitud	230 mm
Length	*9"*
Gewicht / poids / peso	420 g
Weight	*14 3/4 ozs*

Packed in cardboard-boxes per 6 pieces.
Verpackung: in Pappschachteln je 6 Stück.
Emballage: en boîtes de carton par 6 pièces.
Embalaje: en cajas de carton a 6 piezas.

228 A/860

GARDEN SHEARS, forged of high quality steel, bright and polished cutting edges, the rest black varnished. Wooden handles. For cutting hedges.

CISAILLES CE JARDINIERS, forgées en acier de bonne qualité, tranchants blanchis et polis, reste de la surface verni noir. Poignées en bois. Pour couper les haies.

HECKENSCHERE, aus Qualitätsstahl geschmiedet, Schneidebacken blank und poliert, übrige Oberfläche schwarz lackiert, Holzgriffe. Zum Schneiden von Heckenzäunen.

TIJERAS DE JARDINEROS, forjadas de acero de calidad. Bocas cortantes afiladas y pulidas, superficie restante barnizada en negro. Mangos de madera. Para cortar setos de arbustos.

Länge / longueur / longitud	600 mm
Length	*24"*
Länge der Schnittschneide longueur des tranchants longitud de la boca cortante	260 mm
Length of cutting edge	*10 1/4"*
Gewicht / poids / peso	1000 g
Weight	*36 ozs*

Packing: each piece wrapped in paper.
Verpackung: je 1 Stück in Papierpäckchen.
Emballage: en paquets de papier par 1 pièce.
Embalaje: en paquetes de papel a 1 pieza.

229 A/852

TREE CLIPPER. Pressed from steel materials. The knife is made of high quality steel, bright and riveted to the moving arm. The surface is varnished, except for the knife. Delivered without handle. For cutting twigs in tree tops.

ÉCHENILLOIR, fabriqué à la presse, en acier. Tranchant en acier de bonne qualité, blanchi et rivé sur le bras oscillant. Excepté le tranchant, la surface est vernie. Est fourni sans gaule. Pour couper les rameaux dans les cimes d'arbres

RAUPENSCHERE, aus Stahlmaterial gepreßt. Messer aus Qualitätsstahl, blank und auf einen beweglichen Arm aufgenietet. Oberfläche, das Messer ausgenommen, lackiert. Wird ohne Stiel geliefert. Zum Schneiden von Ästen in der Baumkrone.

TIJERAS PARA DESCOCAR prensadas, de material de acero. Cuchillo de acero de calidad, afilado y remachado al brazo movible. Superficie con excepción del cuchillo barnizada; se suministran sin mango. Para cortar ramas en cabezas de arboles.

Länge / longueur / longitud	210 mm
Length	*8 1/4"*
Gewicht / poids / peso	300 g
Weight	*10 1/2 ozs*

Packed in paper bags containing 1 piece each.
Verpackung: in Papierpäckchen je 1 Stück.
Emballage: en paquets de papier par 1 pièce.
Embalaje: en paquetes de papel a 1 pieza.

230 A/2019

TYPE RENTALA PRESSED GARDENING SHEARS. Pressed of steel, with a replaceable steel edge and a replaceable aluminium bearing lining.

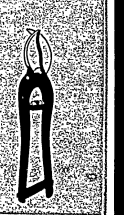
SÉCATEUR DE JARDINIER „RENTALA", fabriqué à la presse, en acier, avec tranchant rechangeable en acier blanchi et garniture de contact rechangeable en aluminium

GARTENSCHERE „RENTALA", aus Stahl gepreßt, mit austauschbarem blankem Stahlmesser und austauschbarem Aluminium-Aufsitzeinsatz.

TIJERAS DE JARDINERO PRENSADAS „RENTALA". Prensadas de acero con un cuchillo de acero y afilado, cambiable y con imposición de tope de aluminio recambiable.

Länge / longueur / longitud	210 mm
Length	*8 1/4"*
Gewicht / poids / peso	200 g
Weight	*7 ozs*

Packing: each piece separately in a carton.
Verpackung: in Papierpäckchen je 1 Stück.
Emballage: en boîtes de carton par 1 pièce.
Embalaje: en cajas de cartón a 1 pieza.



231 A/839

DOUBLE-EDGED GARDENING SHEARS. Forged of a high quality steel, of English shape, bright edges, the handles black varnished.

SÉCATEUR DE JARDINIER À DEUX TRANCHANTS, forgé en acier de bonne qualité, modèle anglais, tranchants blanchis, poignées vernies noir

ZWEISCHNEIDIGE GARTENSCHERE, geschmiedet aus Qualitätsstahl, englische Form, Backen blank, Handgriffe schwarz lackiert.

TIJERAS DE JARDINERO DE DOS CORTES, forjadas de acero de calidad, forma inglesa, bocas cortantes afiladas, mangos barnizados en negro.

Länge / longueur / longitud	210 mm
Length	*8 1/4"*
Gewicht / poids / peso	350 g
Weight	*12 3/8 ozs*

Packed in cardboard-boxes containing 6 pieces each.
Verpackung: in Pappschachteln je 6 Stück.
Emballage: en boîtes de carton par 6 pièces.
Embalaje: en cajas de cartón a 6 pieza.

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232 A/2029

GRAPE CUTTING SHEARS. Pressed of high quality sheet steel, bright cutting edges, the handles black varnished.

SÉCATEUR POUR RAISINS, fabriqué à la presse en tôle d'acier de bonne qualité tranchants blanchis, poignées vernies noir.

TRAUBENSCHERE, aus Qualitätsstahlblech gepreßt, Schneidebacken blank, Handgriffe schwarz lackiert.

TIJERAS PARA UVAS, prensadas de hojalata de acero de calidad, bocas cortantes afiladas, mangos barnizados en negro.

Länge / longueur / longitud	200 mm
Length	*8"*
Gewicht / poids / peso	100 g
Weight	*3 1/2 ozs*

232 0A

GARDENING SHEARS
SÉCATEUR DE JARDINIER

GARTENSCHERE
TIJERAS DE JARDINERO

BRICKLAYER'S TOOLS · MAURERWERKZEUGE
OUTILS DE MAÇON · HERRAMIENTAS PARA ALBANILLES

233 A/437

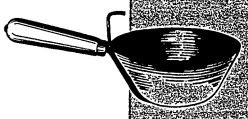
BRICKLAYER'S DIPPER WITH HANDLE. Made of sheet steel. The dipper and the hook are welded to the holding stem. The holding stem end is arranged so as to prevent turning of the handle. The handle provided with ferrule is rammed on the tang and its end then riveted over a washer.

MAURERPFANNE MIT HANDGRIFF aus Stahlblech. Die Pfanne und der Haken sind zum Halter angeschweißt. Der Halter ist an seinem Ende derart ausgebildet, daß sich der Handgriff nicht drehen kann. Der Handgriff ist mit Zwinge versehen und auf die Angel eingetrieben. Das Angelende ist an der Unterlage aufgenietet.

LOUCHE DE MAÇON AVEC POIGNÉE, en tôle d'acier. La louche et le crochet sont soudés au support terminé par une queue de telle façon que la poignée ne puisse tourner. La poignée, munie d'une virole, est emmanchée sur la queue dont l'extrémité est rivée sur une rondelle.

CUCHARÓN PARA ALBAÑILES CON MANGO, de hojalata de acero. Cucharón y percha son soldados al mango. El soporte está terminado de tal forma que el mango no puede girar. Este está equipado con virola la cual encajada en espigo y el extremo de la mismo remachado sobre arandela.

Oberer Durchmesser Diamètre supérieur Diámetro superior Upper diameter	170 mm *6 3/4"*	190 mm *7 1/2"*	210 mm *8 1/4"*
Unterer Durchmesser Diamètre inférieur Diámetro inferior Lower diameter	95 mm *3 3/4"*	110 mm *4 3/8"*	110 mm *4 3/8"*
Handgrifflänge Longueur de la poignée Longitud del mango Length of handle	130 mm *5 1/8"*	130 mm *5 1/8"*	130 mm *5 1/8"*
Gewicht / poids / peso Weight	420 g *14 3/4 ozs*	530 g *18 3/8 ozs*	710 g *25 ozs*



234 A/555

BRICKLAYER'S DIPPER WITH SOCKET.

MAURERPFANNE MIT DÜLLE.

LOUCHE DE MAÇON À DOUILLE.

CUCHARÓN PARA ALBAÑILES, CON CUBO.

Oberer Durchmesser Diamètre supérieur Diámetro superior Upper diameter	220 mm *8 5/8"*	240 mm *9 1/2"*
Unterer Durchmesser Diamètre inférieur Diámetro inferior Lower diameter	120 mm *4 3/4"*	140 mm *5 1/2"*
Durchmesser der Dülle Diamètre de la douille Diámetro de abrazadera Sleeve diameter	36 mm *1 3/8"*	36 mm *1 3/8"*
Gewicht / poids / peso Weight	740 g *26 ozs*	880 g *31 ozs*

235 A/433

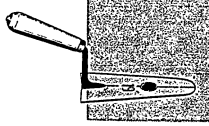
BRICKLAYER'S TROWEL. The blade is made of steel, both sides bright.

TRUELLE DE MAÇON, lame en acier blanchi sur les deux côtés.

MAURERKELLE. Das Blatt aus Stahl, beiderseitig blank.

PALUSTRE PARA ALBAÑILES. Hoja de acero, ambos extremos afilados.

Länge / longueur / longitud	190 mm
Length	*7 1/2"*
Breite / largeur / anchura	105 mm
Width	*4 1/8"*
Gewicht / poids / peso	300 g
Weight	*10 1/2 ozs*



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236 A/436

BRICKLAYER'S TROWEL. Both sides bright. The holder welded to the blade and ended with a tang, forged into a pyramid. The handle is provided with a ferrule rammed on the tang the end of which is riveted over a washer.

TRUELLE DE MAÇON, blanchie sur les deux côtés. Le support est soudé à la lame et terminé par une queue forgée en forme de pyramide. La poignée, munie d'une virole, est emmanchée sur la queue dont l'extrémité est rivée sur une rondelle.

MAURERKELLE, auf beiden Seiten blank. Halter zum Blatt angeschweißt und als zur Pyramide geschmiedete Angel beendet. Handgriff mit Zwinge versehen und auf die Angel aufgeschlagen. Das Angelende auf der Unterlage aufgenietet.

PALUSTRES PARA ALBAÑILES. Ambos extremos afilados. Mango soldado a la hoja y terminado con cubo forjado, con forma de pirámide. Mango equipado con virola y encajado al cubo y el extremo del mismo remachado sobre arandela.

Länge / longueur longitud Length	180 mm 7 3/8"	190 mm 7 1/2"
Breite / largeur anchura Width	125 x 85 mm 5" x 3 3/8"	125 x 90 mm 5" x 3 1/2"
Gewicht / poids peso Weight	310 g 11 ozs	350 g 12 2/8 ozs

Packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans des caisses.
Embalaje: libre en cajas.

237 A/550

BRICK JOINT TROWEL. Both sides bright. The holder welded to the blade and ended with a tang, forged in a pyramid. The handle, provided with a ferrule, rammed on the tang the end of which is riveted over a washer

TRUELLE POUR JOINTS DE BRIQUES, blanchie sur les deux côtés. Le support est soudé à la lame et terminé par une queue forgée en forme de pyramide. La poignée, munie d'une virole, est emmanchée sur la queue dont l'extrémité est rivée sur une rondelle.

FUGENKELLE. Auf beiden Seiten blank. Halter zum Blatt angeschweißt und als zur Pyramide geschmiedete Angel beendet. Handgriff mit Zwinge versehen und auf die Angel aufgeschlagen. Das Angelende auf der Unterlage aufgenietet.

PALUSTRES PARA LAS JUNTURAS DE LADRILLOS. Ambos extremos afilados. Mango soldado a la hoja y terminado con cubo forjado, con forma de pirámide. Mango equipado con virola y encajado al cubo y el extremo del mismo remachado sobre arandela.

Länge / longueur longitud Length	120 mm 4 3/4"	140 mm 5 1/2"	160 mm 6 3/4"
Breite / largeur anchura Width	43 mm 1 11/16"	47 mm 1 7/8"	50 mm 2"
Gewicht / poids peso Weight	110 g 3 7/8 ozs	130 g 4 1/2 ozs	150 g 5 5/16 ozs

Packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans des caisses.
Embalaje libre en cajas.

238 A/551

TILER'S TROWEL. Both sides bright. The holder welded to the blade and ended with a tang, forged in a pyramid. The handle, provided with a ferrule, rammed on the tang the end of which is riveted over a washer.

TRUELLE DE COUVREUR, blanchie sur les deux côtés. Le support est soudé à la lame et terminé par une queue forgée en forme de pyramide. La poignée, munie d'une virole, est emmanchée sur la queue dont l'extrémité est rivée sur une rondelle.

DACHDECKERKELLE. Auf beiden Seiten blank. Halter zum Blatt angeschweißt und als zur Pyramide geschmiedete Angel beendet. Handgriff mit Zwinge versehen und auf die Angel aufgeschlagen. Das Angelende auf der Unterlage aufgenietet.

PALUSTRES PARA TEJADORES. Hoja de acero, ambos extremos afilados. Mango soldado a la hoja y terminado con cubo, forjado con forma de pirámide. Mango equipado con virola y encajado al cubo y el extremo del mismo remachado sobre arandela.

Länge / longueur longitud Length	190 mm 7 1/2"	
Breite / largeur anchura Width	100 mm 4"	
Gewicht / poids peso Weight	280 g 9 7/8 ozs	

Packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans des caisses.
Embalaje libre en cajas.

239 A/552

MASON'S TROWEL. Bright on both sides.

TRUELLE POUR FAÇADES, blanchie sur les deux côtés.

FASADENKELLE. Auf beiden Seiten blank.

PALUSTRES PARA FACHADA. Ambos extremos afilados.

Länge / longueur longitud Length	100 mm 4"	120 mm 4 3/4"	140 mm 5 1/2"	160 mm 6 1/4"
Breite / largeur anchura Width	80 mm 3 1/8"	95 mm 3 3/4"	105 mm 4 1/8"	120 mm 4 3/4"
Gewicht poids / peso Weight	110 g 3 7/8 ozs	130 g 4 1/2 ozs	130 g 4 1/2 ozs	180 g 6 3/8 ozs

Packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans des caisses.
Embalaje: libre en cajas.

240 A/A

RIPPING CHISEL. Both sides bright. The blades welded to the handle.

CISEAU DE PLÂTRIER, blanchie sur les deux côtés. Lames soudées à la poignée.

MODELLIERREISEN. Auf beiden Seiten blank. Blätter zum Handgriff angeschweißt.

CINCELES PARA ESTUCADORES. Ambos extremos afilados. Hojas soldadas al mango.

Länge / longueur / longitud Length	240 mm 9 1/2"	Packing: in packages containing 5 pieces each.
Breite / largeur / anchura Width	28/14 mm 1 1/8 9/16"	Verpackung: je 5 Stück in Päckchen.
Gewicht / poids / peso Weight	70 g 2 1/2 ozs	Emballage: en paquets par 5 pièces. Embalaje: en paquetes a 5 piezas.

241 A/B

RIPPING CHISEL. Both sides bright. The blades welded to the handle.

CISEAU DE PLÂTRIER, blanchie sur les deux côtés Lames soudées à la poignée.

MODELLIERREISEN für Stuckarbeiter. Auf beiden Seiten blank. Blätter zum Handgriff angeschweißt.

CINCELES PARA ESTUCADORES. Ambos extremos afilados. Hojas soldadas al mango.

Länge / longueur / longitud Length	240 mm 9 1/2"	Packing: in packages containing 6 pieces each.
Breite der Blätter / largeur de la lame anchura de las hojas Width	20/8 mm 1 1/8 5/16"	Verpackung: je 6 Stück in Papierpäckchen.
Gewicht / poids / peso Weight	70 g 2 1/2 ozs	Emballage: en paquets par 6 pièces. Embalaje: en paquetes a 6 piezas.

242 A/A

LONG BRICK JOINT TROWEL. The blade is forged, bright and ends in a tang so as to prevent the handle turning round.

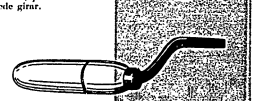
TRUELLE POUR JOINTS, DE BRIQUES LONGUE, lame forgée et blanchie, prolongée en queue de façon que la poignée ne puisse tourner

LANGE FUGENKELLE. Das geschmiedete und blanke Blatt übergeht derart in die Angel, daß sich der Handgriff nicht drehen kann.

PALUSTRES PARA LAS JUNTURAS DE LADRILLOS, LARGOS. Hoja forjada, afilada pasa al cubo de tal forma que el mango no puede girar.

Länge / longueur / longitud Length	180 mm 7 1/8"	Packing: in packages containing 6 pieces each.
Breite / largeur / anchura Width	8 mm 5/16"	Verpackung: je 6 Stück in Päckchen.
Gewicht / poids / peso Weight	120 g 4 1/4 ozs	Emballage: en paquets par 6 pièces. Embalaje: en paquetes a 6 piezas.

243 A/B



SHORT BRICK JOINT TROWEL. The blade is forged and ends in a tang so as to prevent the handle turning round.

TRUELLE POUR JOINTS, DE BRIQUES COURTE, lame forgée et blanchie, prolongée en queue de façon que la poignée ne puisse tourner

KURZE FUGENKELLE. Das geschmiedete und blanke Blatt übergeht derart in die Angel, daß der Handgriff sich nicht drehen kann.

PALUSTRES PARA LAS JUNTURAS DE LADRILLOS, CORTAS. Hoja forjadas, afiladas, pasan al cubo de tal forma que el mango no puede girar.

Blattlänge / longueur de la lame longitud de la hoja Length of blade	50 mm 2"	Packing in packages containing 6 pieces each.
Breite / largeur / anchura Width	8 mm 5/16"	Verpackung: je 6 Stück in Päckchen.
Gewicht / poids / peso Weight	110 g 3 7/8 ozs	Emballage: en paquets par 6 pièces. Embalaje: en paquetes a 6 piezas.

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244 A/

BRICKLAYER'S PLATE. Made of galvanized sheet. Reinforced on the circumference by steel wire 2 mm in diameter. Handle for screwing in the socket.

ASSIETTE DE MAÇON, en tôle zinguée, renforcée sur le périmètre par un fil de fer de 2 mm de diamétre. Poignée a visser dans la douille.

MAURERTELLER Aus verzinktem Blech, am Umfang durch Umrandung aus Stahldraht ø 2 mm versteift. Der Handgriff wird in die Zwinge eingeschraubt.

PLATO PARA ALBAÑILES De hojalata galvanizada en circunferencia reforzada con alambre de acero de ø 2 mm. Mango se atornilla en la abrazadera.

Tellerdurchmesser diamètre de l assiette diámetro del plato Plate diameter	380 mm *15"*
Gewicht / poids / peso Weight	950 g *33 1/2 ozs*

245 A/438

CONCRETING FLOAT. The blade made of steel, the working surface bright. The handle set on the holder and secured against turning.

PALETTE POUR BETON, lame en acier, surface de travail blanchie. La poignée est emmanchée sur le support et assurée pour ne pas tourner.

BETON-GLATTEISEN. Stahlblatt, Arbeitsfläche blank. Handgriff auf dem Halter eingesetzt und gegen Drehen gesichert.

PALUSTRES PARA ALISAR HORMIGÓN. Hoja de acero, superficie de trabajo cepillada. Mango encajado al soporte y asegurado contra el giro.

Länge / longueur longitud Length	120 mm *4 3/4"*	150 mm *6"*	180 mm *7 1/8"*
Breite / largeur anchura Width	70 mm *2 3/4"*	100 mm *4"*	130 mm *5 1/8"*
Gewicht / poids / peso Weight	270 g *9 1/2 ozs*	320 g *11 1/4 ozs*	370 g *13 ozs*

Packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans des caisses.
Embalaje: libre en cajas.

246 A/439/A

PLASTERING TROWEL. The blade made of steel, the working surface bright.

PLATOIR, lame en acier, surface de travail blanchie.

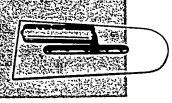
MAURERGLATTEISEN. Stahlblatt, Arbeitsfläche blank.

PALUSTRES DE ALISAR. Hoja de acero, superficie del trabajo cepillada.

Länge / longueur / longitud Length	280 mm *11"*
Breite / largeur / anchura Width	125 mm *5"*
Gewicht / poids / peso Weight	360 g *12 3/4 ozs*

Packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage en vrac dans des caisses.
Embalaje: libre en cajas.

247 A/439/B



PLASTERING TROWEL. The blade is of trapezoidal shape, rounded, made of steel, the working surface bright.

PLATOIR, lame trapézoïdale, arrondie, en acier, surface de travail blanchie.

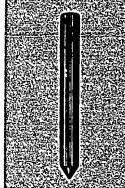
MAURERGLATTEISEN. Trapezförmiges abgerundetes Stahlblatt, Arbeitsfläche blank

PALUSTRES DE ALISAR. Hoja de trapecio, redondeada, de acero, con superficie de trabajo cepillada

Länge / longueur / longitud Length	280 mm *11"*
Breite / largeur / anchura Width	125 mm *5"*
Gewicht / poids / peso Weight	320 g *11 1/4 ozs*

Packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans des caisses.
Embalaje libre en cajas.

248 A/44



CYLINDRICAL PLUMMET. Turned and provided with a suitable hole for the string.

CONTREPOIDS POUR FIL À PLOMB, forme cylindrique, tourné, muni d'une ouverture pour attacher do fil.

WALZENFÖRMIGES SENKBLEI. Blank und mit geeigneter Öse zum Schnureinfädeln versehen.

PLOMADA CILINDRICA. Torneada y con abertura conveniente para enhebrar el cordon.

Länge / longueur / longitud Length	120 mm *4 3/4"*	180 mm *7 1/8"*	250 mm *10"*
Durchmesser / diamètre / diámetro Diamter	16 mm *5/8"*	18 mm *23/32"*	20 mm *25/32"*
Gewicht / poids / peso Weight	160 g *5 5/8 ozs*	330 g *11 5/8 ozs*	550 g *19 3/8 ozs*

Packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage: en vrac dans des caisses.
Embalaje: libre en cajas.

249 A/445

CONICAL PLUMMET. Made of grey cast iron, turned, steel suspension, varnished.

CONTREPOIDS POUR FIL À PLOMB, piriforme, en fonte grise, tourné, oeil de suspension en acier, verni.

BIRNENFÖRMIGES SENKBLEI aus Grauguß, blank mit Stahlplatte zum Aufhängen, lackiert.

PLOMADA DE PERRA, modelo inglés, de fundición gris, torneada, suspensión de acero.

Höhe / hauteur / altura Height	52 mm *2 1/16"*	72 mm *2 7/8"*
Breite / largeur / anchura Width	28 mm *1 1/8"*	37 mm *1 1/2"*
Gewicht / poids / peso Weight	200 g *7 ozs*	300 g *10 ozs*

Packed unwrapped in cases.
Verpackung: lose in Kisten.
Emballage. en vrac dans des caisses.
Embalaje: libre en cajas.

250 A

SELF-FEEDING PAINTERS APPLIANCE Made of galvanized sheet. The rollers made of plastics. On the side walls the roller guides and movable fixtures holding the pattern roller are mounted. A rubber wiper bears against the large roller.

MACHINE À PEINDRE LES MURS, à alimentation automatique. En tôle de zinc. Rouleaux en matière artificielle. Sur les parois latérales sont fixés les liteaux de guidage des rouleaux et les supports mobiles pour la fixation du rouleau à dessin. Sur le grand rouleau s'applique un liteau d'essuyage en caoutchouc.

GESPEISTE MALERMASCHINE. Aus verzinktem Blech, Walzen aus Kunstmasse. An den Seitenwänden sind Führungsleisten für die Walzen und bewegliche Halter zur Befestigung der Musterwalze angebracht. Auf der großen Walze liegt eine Gummiabwischleiste auf.

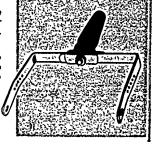
APARATO PARA PINTORES CON MOJADA AUTOMATICA. De hojalata galvanizada, rodillos masa artificial. Ambos extremos llevan fijados listones de guia para los cilindros, y soportes movibles para fijar los mismos de muestra. Sobre el cilindro mayor se asienta el listón de goma para desplayar el color sobrante.

Gewicht / poids / peso Weight	640 g *22 1/2 ozs*

Accessories: 2 rollers and the wiper.
Zubehör: 2 Walzen und eine Gummiabwischwalze.
Accessoires: 2 rouleaux et 1 liteau d'essuyage.
Accesorio: 2 cilindros (rodillos) y limpiador.

Packing: each piece separately in a cardboard box.
Verpackung: je 1 Stück in Pappschachteln.
Emballage: en boites de carton par 1 pièce.
Embalaje: 1 pieza en caja de cartón.

251 A



PAINTERS APPLIANCE BRACKET. The arms are made of flat steel, adjustable to different roller lengths. They are fastened by means of a bolt secured in a wooden handle.

FOURCHE DE PEINTRE EN BÂTIMENTS Les bras en acier plat, réglables pour différentes longueurs des rouleaux, sont fixés a l'aide du boulon qui est solidaire de la poignée en bois.

MALERGABEL. Arme aus Flachstahl, auf verschiedene Walzenlängen einstellbar. Diese werden mittels einer Klemme befestigt, die im Holzgriff fest gesichert ist.

HORQUILLA PARA PINTORES. Brazos de acero plano, ajustables a varias larguras de los cilindros. Se fijan por medio del pasador, asegurado en el mango de madera.

Gewicht / poids / peso Weight	250 g *8 2/4 ozs*

MOTOKOV PRAHA · CZECHOSLOVAKIA

A

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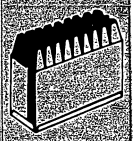

STEEL LETTER STAMPS · STAHLBUCHSTABEN · LETTRES ET CHIFFRES EN ACIER · LETRAS Y CIFRAS, DE ACERO

253 A/1195

STEEL LETTERS. — STAHLBUCHSTABEN.
LETTRES EN ACIER. — LETRAS DE ACERO.

Größe / grandeur / tamano / Size	1	1 1/2	2	2 1/2	3	3 1/2	4	5	6	7	8	9	10 mm
	3/64"	1/16"	5/64"	3/32"	1/8"	9/64"	5/32"	3/16"	1/4"	9/32"	5/16"	3/8"	13/32"
Gewicht / poids / peso / Weight	0,08	1,14	1,28	1,40	1,67	1,80	2	2,60	2,98	3,40	4,10	5,50	6,30 g
	1/32	5/128	3/64	7/128	7/128	1/16	9/128	3/32	13/128	1/8	5/32	3/16	7/32 ozs

254 A/1194

STEEL FIGURES. — STAHLZIFFERN.
CHIFFRES EN ACIER. — CIFRAS DE ACERO.

Größe/grandeur / tamano / Sizo	1	1 1/2	2	2 1/2	3	3 1/2	4	5	6	7	8	9	10 mm
	3/64"	1/16"	5/64"	3/32"	1/8"	9/64"	5/32"	3/16"	1/4"	9/32"	5/16"	3/8"	13/32"
Gewicht / poids / peso / Weight	0,39	0,45	0,52	0,58	0,65	0,74	0,84	0,95	0,99	1,04	1,23	1,40	1,70 g
	1/64	1/64	1/64	3/128	3/128	3/128	1/32	1/32	1/32	5/128	3/64	7/128	1/16 ozs

WIRE BRUSHES · METALLBÜRSTEN · BROSSES METALLIQUES CEPILLOS DE METAL

HAND BRUSHES. — HANDBÜRSTEN.
BROSSES À MAIN. — CEPILLOS A MANO.

255 A/1306

HAND WIRE BRUSH. With handle, three rows of martensitic, black heat-treated, smooth wire, 1/64" in diameter. The wooden part coated with transparent laequer.

HANDBÜRSTE mit Handgriff, dreireihig, martensitischer schwarzer, gehärteter glatter Draht, 0,30 mm. Holz mit farblosem Lack gespritzt.

BROSSE À MAIN à 3 rangs, avec poignée, fils métalliques de 0,30 mm trempés noir martencitiques, lisses. Bois enduit de vernis incolore.

CEPILLO A MANO de 3 filas, con puño. Alambre martensítico, templado negro, ø 30 mm. liso. Madera barnizada en transparente.

Länge / longueur / longitud / Length	290 mm / 11 1/2"
Kratzenstoff-Länge / longueur de la carde / longitud de la carda / Length of card	160 mm / 6 3/8"
Höhe des Bündels / hauteur des fils / altura del alambre / Height of wire bundle	23 mm / 7/8"
Holzstärke / épaisseur du bois / espesor de madera / Thickness of board	17 mm / 11/16"
Gewicht / poids / peso / Weight	125 g / 4 3/8 ozs

255 A/1326

HAND WIRE BRUSH with naturally hard wavy wire. — HANDBÜRSTE, naturharter Wellendraht.

BROSSE À MAIN à 3 rangs, avec poignée, fils métalliques de dureté, ondulés. — CEPILLO A MANO de 3 filas, con puño, alambre duro natural ondulante.

Länge / longueur / longitud / Length	290 mm / 11 1/2"
Kratzenstoff-Länge / longueur de la carde / longitud de la carda / Length of card	160 mm / 6 3/8"
Höhe des Bündels / hauteur des fils / altura del alambre / Height of wire bundle	23 mm / 7/8"
Holzstärke / épaisseur de bois / espesor de madera / Thickness of board	17 mm / 11/16"
Gewicht / poids / peso / Weight	135 g / 4 3/4 ozs

255 A/1406

HAND WIRE BRUSH, 4 rows of martensitic, black heat-treated smooth wire, 1/64" in diameter. — HANDBÜRSTE, vierreihig, martensitischer schwarzer, gehärteter glatter Draht 0,30 mm.

BROSSE À MAIN à 4 rangs, fils métalliques de 0,30 mm, martensitiques trempés noir, lisses. — CEPILLO A MANO, 4 filas, alambre martensítico templado negro, liso 0,30 mm.

Länge / longueur / longitud / Length	295 mm / 11 5/8"
Kratzenstoff-Länge / longueur de la carde / longitud de la carda / Length of card	155 mm / 6 1/8"
Höhe des Bündels / hauteur des fils / altura del alambre / Height of wire bundles	23 mm / 7/8"
Holzstärke / épaisseur du bois / espesor de madera / Thickness of board	17 mm / 11/16"
Gewicht / poids / peso / Weight	150 g / 5 5/16 ozs

255 A/1426

HAND WIRE BRUSH, 4 rows of naturally hard, wavy wire, 1/64" in diameter. — HANDBÜRSTE, vierreihig, naturharter Wollendraht, 0,30 mm.

BROSSE À MAIN, à 4 rangs, fils métalliques de dureté naturelle, ondulés, de 0,30 mm. — CEPILLO A MANO, 4 filas, alambre duro natural ondulante 0,30 mm.

Länge / longueur / longitud / Length	295 mm / 11 3/8"
Kratzenstoff-Länge / longueur de la carde / longitud de la carda / Length of card	155 mm / 6 1/8"
Höhe des Bündels / hauteur des fils / altura del alambre / Height of wire bundles	23 mm / 7/8"
Holzstärke / épaisseur du bois / espesor de madera / Thickness of board	17 mm / 11/16"
Gewicht / poids / peso / Weight	165 g / 5 7/8 ozs

255 A/1506

HAND WIRE BRUSH, 5 rows of martensitic, black heat-treated smooth wire, 1/64" in diameter. — HANDBÜRSTE, fünfreihig, martensitischer schwarzer gehärteter glatter Draht, 0,30 mm.

BROSSE À MAIN, à 5 rangs, fils métalliques de 0,30 mm, martensitiques trempés noir, lisses. — CEPILLO A MANO, 5 filas, alambre martensítico, templado negro, liso 0,30 mm.

Länge / longueur / longitud / Length	300 mm / 11 7/8"
Kratzenstoff-Länge / longueur de la carde / longitud de la carda / Length of card	165 mm / 6 1/2"
Höhe des Bündels / hauteur des fils / altura del alambre / Height of wire bundle	23 mm / 7/8"
Holzstärke / épaisseur du bois / espesor de madera / Thickness of board	17 mm / 11/16"
Gewicht / poids / peso / Weight	190 g / 6 5/8 ozs

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A

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255 A/1526

HAND WIRE BRUSH, 5 rows of naturally hard, wavy wire, 1/64" in diameter.

BROSSE À MAIN, à 5 rangs, fils métalliques de dureté naturelle, ondulés, de 0,30 mm.

HANDBÜRSTE, fünfreihig, naturharter Wellendraht 0,30 mm.

CEPILLA A MANO, 5 filas, alambre duro natural ondulante, 0,30 mm.

Länge / longueur / longitud	300 mm *11 7/8"*
Length	165 mm
Kratzenstoff-Länge / longueur de la carde / longitud de la carda	*6 1/2"*
Length of card	23 mm
Höhe des Bündels / hauteur des fils / altura del alambre	*7/8"*
Height of wire bundles	17 mm
Holzstärke / épaisseur du bois / espesor de madera	*11/16"*
Thickness of board	196 g
Gewicht / poids / peso	*6 3/4 ozs*
Weight	

255 A/1606

HAND WIRE BRUSH, 6 rows of martensitic, black heat-trented smooth wire, 1/64" in diameter.

BROSSE À MAIN, a 6 rangs, fils métalliques de 0,30 mm martensitiques, trempés noir — lisses.

HANDBÜRSTE, sechsreihig, martensitischer schwarzer, gehärteter glatter Draht 0,30 mm.

CEPILLO A MANO, 6 filas, alambre martensítico, templado negro, liso 0,30 mm.

Länge / longueur / longitud	305 mm *12"*
Length	176 mm
Kratzenstoff-Länge / longueur de la carde / longitud de la carda	*7"*
Length of card	23 mm
Höhe des Bündels / hauteur des fils / altura del alambre	*7/8"*
Height of wire bundles	17 mm
Holzstärke / épaisseur du bois / espesor de madera	*11/16"*
Thickness of board	200 g
Gewicht / poids / peso	*7 ozs*
Weight	

255 A/1626

HAND WIRE BRUSH, 6 rows of naturally hard, wavy wire, 1/64" in diameter.

BROSSE À MAIN, a 6 rangs fils métalliques de dureté naturelle, ondulés, de 0,30 mm.

HANDBÜRSTE, sechsreihig, naturharter Wellendraht 0,30 mm.

CEPILLO A MANO, 6 filas, alambre duro natural condulante, 30 mm.

Länge / longueur / longitud	305 mm *12"*
Length	175 mm
Kratzenstoff-Länge / longueur de la carde / longitud de la carda	*7"*
Length of card	23 mm
Höhe des Bündels / hauteur des fils / altura del alambre	*7/8"*
Height of wire bundlo	17 mm
Holzstärke / épaisseur du bois / espesor de madera	*11/16"*
Thickness of board	205 g
Gewicht / poids / peso	*7 1/4 ozs*
Weight	

HAND WIRE BRUSHES WITHOUT HANDLE · HANDBÜRSTEN OHNE HANDGRIFF · BROSSES A MAIN SANS POIGNEE · CEPILLOS DE MANO SIN MANGO

256 A/2306

HAND WIRE BRUSH WITHOUT HANDLE, 5 rows of martensitic black heat-treated, smooth wire, 1/64" in diameter.

BROSSE À MAIN SANS POIGNÉE, à 5 rangs, fils métalliques de 0,30 mm martensitiques, trempés noir, lisses.

HANDBÜRSTE OHNE HANDGRIFF, fünfreihig, martensitischer schwarzer, gehärteter glatter Draht 0,30 mm.

CEPILLOS DE MANO SIN MANGO de 5 filas, alambre martensítico, templado negro, liso 0,30 mm.

Länge / longueur / longitud	200 mm *7 7/8"*
Length	50 mm
Breite / largeur / anchura	*2"*
Width	17 mm
Holzstärke / épaisseur du bois / espesor de madera	*11/16"*
Thickness of board	23 mm
Höhe des Bündels / hauteur des fils / altura del alambre	*7/8"*
Height of wire bundle	170 g
Gewicht / poids / peso	*6 ozs*
Weight	

256 A/2406/7

HAND WIRE BRUSH WITHOUT HANDLE, 7 rows of martensitic black heat-treated, smooth wire, 1/64" in diameter.

BROSSE À MAIN SANS POIGNÉE, à 7 rangs, fils métalliques de 0,30 mm martensitiques, trempés noir, lisses.

HANDBÜRSTE OHNE HANDGRIFF, siebenreihig, martensitischer schwarzer, gehärteter glatter Draht 0,30 mm.

CEPILLOS DE MANO SIN MANGO de 7 filas, alambre martensítico, templado negro, liso 0,30 mm.

Länge / longueur / longitud	213 mm
Length	*8 3/8"*
Breite / largeur / anchura	55 mm
Width	*2 1/8"*
Holzstärke / épaisseur du bois / espesor de madera	17 mm
Thickness of board	*11/16"*
Höhe des Bündels / hauteur des fils / altura del alambre	23 mm
Height of wire bundle	*7/8"*
Gewicht / poids / peso	220 g
Weight	*7 3/4"*

256 A/2426/7 — 256 A/2525

HAND WIRE BRUSH WITHOUT HANDLE, 7 rows of naturally hard, wavy wire, 1/64" in diameter.

BROSSES À MAIN SANS POIGNÉE, à 7 rangs, fils métalliques, du dureté naturelle, ondulés de 0,30 mm.

HANDBÜRSTE OHNE HANDGRIFF, siebenreihig, martensitischer schwarzer, gehärteter glatter naturharter Wellendraht 0,30 mm.

CEPILLOS DE MANO SIN MANGO de 7 filas, alambre duro natural ondulante 0,30 mm.

	2426/7	2525
Länge / longueur / longitud	213 mm	216 mm
Length	*8 3/8"*	*8 1/2"*
Breite / largeur / anchura	55 mm	58 mm
Width	*2 1/8"*	*2 1/4"*
Holzstärke / épaisseur du bois / espesor de madera	17 mm	17 mm
Thickness of board	*11/16"*	*11/16"*
Höhe des Bündels / hauteur des fils / altura del alambre	23 mm	23 mm
Height of wire bundle	*7/8"*	*7/8"*
Gewicht / poids / peso	280 g	210 g
Weight	*9 7/8 ozs*	*7 3/8 ozs*

MEXICO WIRE BRUSHES · MEXICO-BÜRSTEN · BROSSES MEXICO · CEPILLO MEXICANO

257 A/MI

HAND WIRE BRUSH, SPECIAL, with handle, 4 rows, milled shape 20—28 mm, martensitic black heat-treated smooth wire.

BROSSE À MAIN SPECIALE avec poignée, à 4 rangs, forme fraisée 20—28 mm, fils métalliques martensitiques, trempés noir, lisses.

SPEZIELLE HANDBÜRSTE MIT HANDGRIFF, vierreihig, gefräste Form 20—28 mm, martensitischer schwarzer, gehärteter glatter naturharter Wellendraht.

CEPILLOS A MANO ESPECIALES con mango de 4 filas, forma fresada 20—28 mm, alambre martensítico, templado negro, liso.

	M I	M II	M III	M III a without handle / ohne Griff sans poignée / sin mango
Länge / longueur / longitud	265 mm	342 mm	182 mm	190 mm
Length	*10 1/2"*	*13 1/2"*	*7 1/8"*	*7 1/2"*
Breite / largeur / anchura	29 mm	26 mm	55 mm	77 mm
Width	*1 1/8"*	*1"*	*2 1/8"*	*3"*
Kratzenstoff-Länge / longueur de la carde longitud de la carda	145 mm	165 mm		
Length of card	*5 3/4"*	*6 1/2"*		
Holzstärke / épaisseur du bois espesor de madera	17 mm	17 mm	21 mm	22 mm
Thickness of board	*11/16"*	*11/16"*	*13/16"*	*7/8"*
Höhe des Bündels / hauteur des fils altura del alambre	30 mm	30 mm	30 mm	30 mm
Height of wire bundle	*7 3/16"*	*1 3/16"*	*1 3/16"*	*1 3/16"*
Number of rows / Reihenzahl nombre de rangs / número de filas	4	3	6	9
Gewicht / poids / peso	200 g	160 g	280 g	380 g
Weight	*7 ozs*	*5 5/8 ozs*	*9 7/8*	*13 3/8 ozs*

258 A

ROUND WIRE BRUSH manufactured from dia 2" to 14".

BROSSE RONDE, fabriquée en dia 50 mm — 350 mm.

RUNDE DRAHTBÜRSTE, erzeugt in ⌀ 50 mm — ⌀ 350 mm.

CEPILLO CIRCULAR de metal producido en el diámetro de 50 mm hasta 350 mm.

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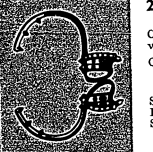

261 A/800

CLIMBING IRONS FOR FITTERS, galvanized.
GRIMPETTES DE MONTEUR, zinguées.

STEIGEISEN FÜR MONTEURE, verzinkt.
TREPADORES PARA MONTADORES. Galvanizadas.

Spannweite / envergure Dimensión de abertura Span	210 mm *8 1/4″*	260 mm *10 1/4″*

TRADE MARK

WOODEN FOLDING RULES · GLIEDERMASSSTÄBE · METRES EN BOIS · METROS PLEGABLES

268 A/1816

ASTRA WOODEN FOLDING RULES.
MÈTRES PLIANTS EN BOIS "ASTRA".

Fünfteilig 1 m ohne Federn
à 5 branches, longueur 1 m, sans ressorts
1 m de 5 brazos sin resortes
Five joints 39″ without springs

sechsteilig 1 m ohne Federn
à 6 branches, longueur 1 m sans ressorts
1 m de 6 brazos sin resortes
Six joints 39″ without springs

HOLZGLIEDERMASSSTAB „ASTRA".
METROS PLEGABLES DE MADERA "ASTRA".

zehnteilig 1 m ohne Federn
à 10 branches, longueur 1 m, sans ressorts
1 m de 10 brazos sin resortes
Ten joints 39″ without springs

Packing: per 100 dozen.
Verpackung: je 100 Dutzend.
Emballage: par 100 douzaines.
Embalaje: a 100 docenas.

269 A/1817 B

PERKUS WOODEN FOLDING RULES.
MÈTRES PLIANTS EN BOIS "PERKUS".

Fünfteilig 1 m mit Federn
à 5 branches, longueur 1 m, avec ressorts
1 m de brazos con resortes
Five joints, 39″, with springs

sechsteilig 1 m mit Federn
à 6 branches, longueur 1 m, avec ressorts
1 m de 6 brazos con resortes
Six joints, 39″, with springs

HOLZGLIEDERMASSSTAB „PERKUS"
METROS PLEGABLES DE MADERA "PERKUS"

zehnteilig 1 m mit Federn
à 10 branches, longueur 1 m, avec ressorts
1 m de 10 brazos con resortes
Ten joints, 39″, with springs

Packing: per 200 dozen.
Verpackung: je 200 Dutzend.
Emballage: par 200 douzaines.
Embalaje: a 200 docenas.

270 A/1817

PERFECT WOODEN FOLDING RULES.
DOUBLES MÈTRES PLIANTS EN BOIS "PERFEKT".

Zehnteilig 2 m mit Federn
à 10 branches, longueur 2 m, avec ressorts
Metro doble de 10 brazos con resortes
Ten joints, 78″, with springs

Zwölfteilig 2 m mit Federn
à 12 branches, longueur 2 m, avec ressorts
Metro doble de 12 brazos con resortes
Twelve joints, 78″, with springs

HOLZGLIEDERMASSSTAB „PERFEKT".
METROS PLEGABLES DE MADERA PERFEKT, DOBLES.

Packing: per 100 dozen.
Verpackung: je 100 Dutzend.
Emballage: par 100 douzaines.
Embalaje: a 100 docenas.

All these folding rules can be delivered graduated either in M/M or M/L.
Sämtliche Holzgliedermaßstäbe sind mit der Teilung M/M oder M/L lieferbar.
Ces mètres peuvent etre livrés avec divisions en système métrique ou en système anglais.
Todos los metros se suministran en dos ejecuciones, en medidas de cm/cm o cm/pulgadas

271/A

WOODEN FOLDING RULES — IN FEET.
12 joints, 6 feet, with springs, white or yellow varnished.

MÈTRES PLIANTS EN BOIS mesures système anglais à 12 branches, longueur 6 pieds, avec ressorts, présentation en blanc ou en jaune.

FUSS-HOLZGLIEDERMASSSTAB, zwölfteilig, sechsfüßig mit Federn. Ausführung weiß oder gelb.

METROS PLEGABLES DE MADERA EN PULGADAS. De 12 brazos, 6 pies con resortes. Ejecución: en blanco o amarillo.

Packing: per 100 dozen.
Verpackung: je 100 Dutzend.
Emballage: par 100 douzaines.
Embalaje: a 100 docenas.

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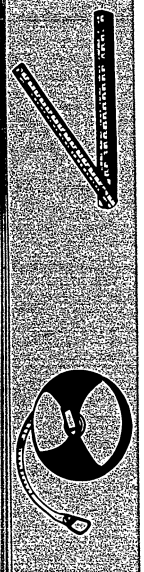

272 A

WOODEN FOLDING RULES WITH 3 GRADUATIONS, M/L/B 8 and 10 joints.

MÈTRES PLIANTS DE BOIS AVEC 3 SYSTÈMES DE MESURES / métrique anglais, Burgos / à 8 et 10 branches.

HOLZGLIEDERMASSSTÄBE mit 3 Maßen M/L/B. Acht- und zehnteilig.

METROS PLEGABLES DE MADERA CON TRES MEDIDAS, cm / pulgadas / Burgones. Metros plegables de 8 brazos y 10 brazos.

Packing: per 100 dozen.
Verpackung: je 100 Dutzend.
Emballage: par 100 douzaines.
Embalaje: a 100 docenas.

The folding rules can be delivered with different inscriptions. For example, for the Dutch market with Dutch inscriptions, for the Indonesian with Indonesian ones etc.
Die Gliedermaßstäbe können mit verschiedenen Aufschriften geliefert werden. Zum Beispiel für den holländischen Markt mit holländischer Aufschrift, für den indonesischen Markt mit indonesischer Aufschrift usw.
Nous pouvons fournir les mètres pourvues d'inscriptions en différentes langues. Par ex. pour le marché hollandais en langue hollandaise, pour le marché indonésien en langue indonésienne etc.
Con posibilidad de suministrar metros con diferentes inscripciones. P.e. para mercado holandes con inscripción holandesa, para mercado mexicano en español etc.

TAPES · ROLLBANDMASSE · MESURES A RUBAN · CINTAS PARA MEDIR

273 A/1390 B

LINEN MEASURING TAPES in leather cases.

MESURES À RUBAN DE TOILE en boite de cuir.

LEINENROLLBANDMASSE in Lederkapsel.

CINTAS PARA MEDIR DE TELA en caja de cuero.

Bandbreite / largeur du ruban / anchura de la cinta							13 mm
Width of tape							*1/2"*
Länge / longueur / longitud	5	10	12	20	25	30	50 m
Length	*5 1/2*	*11*	*13 1/8*	*21 7/8*	*27 3/8*	*32 7/8*	*50 6/8* yards
Gewicht / poids / peso	30	44	52	70	95	106	150
Weight	*–/10 1/2*	*–/15 1/2*	*1/2 3/8*	*1/8 5/8*	*2/1 1/2*	*2/5 1/4*	*3/4 3/4* lbs

Delivered with graduations in M/M, or M/L, or L/L, or with graduation on one side only.
Diese Maße werden mit M/M oder M/L oder L/L oder mit einseitiger Teilung geliefert.
Sont fournies avec division M/M ou M/L ou L/L ou bien d'un coté seulement.
Se suministran en medidas de M/M o M/P o P/P o con medidas sobre un lado.

274 A/1392 B

STEEL TAPES RULES in leather or tin cases.

MESURES À RUBAN D'ACIER en boite de cuir ou de tôle.

STAHLROLLBANDMASSE in Leder oder Blechkapsel.

CINTAS PARA MEDIR DE ACERO en caja de cuero o de hojalata.

Bandbreite / largeur du ruban / anchura de la cinta							13 mm
Width of tape							*1/2"*
Länge / longueur / longitud	5	10	12	20	25	30	50 mm
Length	*5 1/2*	*11*	*13 1/8*	*21 7/8*	*27 3/8*	*32 7/8*	*54 6/8* yards
Packing:							
Verpackung:							
Emballage:							
Embalaje:							

Delivered with graduations in M/M, or M/L, or L/L or with graduation one side only.
Dieses Maß wird mit einer M/M oder M/L oder L/L oder einseitigen Teilung geliefert.
Sont fournies avec division M/M ou M/L ou L/L ou bien d'un côté seulement.
Se suministran en medidas de M/M o M/P o P/P o con medidas sobre un lado.
The first 10 cm are divided into mm.
Erste 10 Zentimeter mit Millimeterteilung.
Les 10 cm premiers sont divisés en millimètres.
Primeros 10 cm tienen división en milimetros.

275 A/1394 B

STEEL TAPES IN BRASS BRACKET.

MESURES À RUBAN D'ACIER EN FOURCHE DE LAITON.

STAHLROLLBANDMASS mit Messingbügel.

CINTAS DE ACERO EN HORQUILLA DE LATÓN.

Bandbreite / largeur du ruban / anchura de la cinta						13 mm
Width of tape						*1/2"*
Bandlänge / longueur du ruban longitud	10	15	20	25	30	50 mm
Length of tape	*11"*	*16 3/8"*	*21 7/8"*	*27 3/8"*	*32 7/8"*	*54 6/8"*
Packing:						
Verpackung:						
Emballage:						
Embalaje:						

Delivered with graduations in M/M, or M/L, or L/L or with graduation on one side.
Dieses Maß wird mit einer M/M oder M/L oder L/L oder einseitigen Teilung geliefert.
Sont fournies avec division M/M ou M/L ou L/L ou bien d'un côté seulement.
Se suministran en medidas de M/M o M/P o P/P o con medidas sobre un lado.
The first 10 cm are divided into mm.
Erste 10 Zentimeter mit Millimeterteilung.
Les 10 cm premiers sont divisés en millimètres
Primeros 10 cm tienen división en milimetros.

STEEL POCKET RULES · STAHLROLLBANDMASSE · METRES METALLIQUES · METROS DE METAL

276 A/755

SALDO PICCOLO STEEL POCKET RULES in semi-closed metal cases.

MÈTRES ROULEAUX "SALDO PICCOLO" en boite métallique demi-fermée.

TASCHENROLLBANDMASS „SALDO PICCOLO" mit halbgeöffneter Metallbüchse.

METROS DE METAL "SALDO PICCOLO" en cápsula semiabierta de metal.

Breite / largeur / anchura	9 mm	Länge / longueur / longitud	1 oder / ou / o 2 m
Width	*3/8"*	Length	*39"* or *78"*
Gewicht / poids / peso	160 kg		
Weight	*330* lbs *11* ozs		

277 A/751

SALDO SIMPLEX STEEL POCKET RULES in semi-closed metal cases.

MÈTRES ROULEAUX "SALDO SIMPLEX" en boite métallique demi-fermée.

TASCHENROLLBANDMASS „SALDO SIMPLEX" in halbgeöffneter Metallbüchse.

METROS DE METAL "SALDO SIMPLEX" en cápsula semiabierta de metal.

Breite / largeur / anchura	15 mm	Länge / longueur / longitud	2 m
Width	*19/32"*	Length	*78"*
Gewicht / poids / peso	145 kg		
Weigth	*319* lbs *11* ozs		

278 A/750

STANDARD STEEL POCKET RULES in fully closed metal cases.

MÈTRES ROULEAUX "STANDARD" en boite métallique fermée.

TASCHENROLLBANDMASS „STANDARD" in geschlossener Metallbüchse.

METROS DE METAL STANDARD en cápsula cerrada de metal.

Breite / largeur / anchura	15 mm	Länge / longueur / longitud	2 m
Width	*19/32"*	Length	*78"*
Gewicht / poids / peso	115 kg		
Weight	*255* lbs *15* ozs		

279 A/754

PROGRES STEEL POCKET RULES in fully closed metal case.

MÈTRES ROULEAUX "PROGRESS" en boite métallique fermée.

TASCHENROLLBANDMASS „PROGRESS" in geschlossener Metallbüchse.

METROS DE METAL PROGRES en cápsula cerrada de metal.

Breite / largeur / anchura	9 mm	Länge / longueur / longitud	2 m
Width	*3/8"*	Length	*78"*
Gewicht / poids / peso	160 kg		
Weight	*330* lbs *11* ozs		

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SQUARES FOR LOCKSMITHS · SCHLOSSERWINKEL · EQUERRES · ESCUADRAS

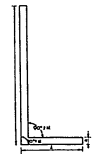
280 A/5146

FLAT SQUARE FOR LOCKSMITHS — made of steel.

FLACHER SCHLOSSERWINKEL aus Stahl.

ÉQUERRE DE SERRURIER, PLATE, en acier.

ESCUADRAS PLANAS PARA CERRAJEROS de acero.



V	L	S	a	Gewicht/poids/peso kg	weight lbs
100 4"	70 2 3/4"	3 1/8"	16 5/8"	0,058	–/2
200 8"	130 5 1/8"	4 3/16"	25 1"	0,230	–/8 3/8
250 10"	160 6 3/8"			0,302	–/10 1/2
300 12"	170 6 3/4"	6 1/4"	30 1 1/8"	0,640	1/5 7/8
400 16"	200 8"			0,803	1/13 1/4
500 20"	250 10"	8 5/16"	40 1 5/8"	1,366	3/–
600 24"	300 12"			2,158	4/12

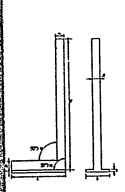
281 A/5147

BACK SQUARE FOR LOCKSMITHS — made of steel. The bevel plate are screwed at an angle of 90°.

SCHLOSSERWINKEL MIT ANSCHLAG, aus Stahl. Anschlag im Winkel von 90° angeschraubt.

ÉQUERRE DE SERRURIER À CHAPEAU, en acier. Chapeau fixée par vis, angles 90°.

ESCUADRAS CON REBORDE PARA CERRAJEROS, de acero. Alas atornilladas de 90° adicionales.



V	L	S	a	b
100 4"	70 2 3/4"	3 1/8"	16 5/8"	16 5/8"
200 8"	130 5 1/8"	4 3/16"	25 1"	25 1"
250 10"	160 6 3/8"			
300 12"	170 6 3/4"	6 1/4"	30 1 1/8"	30 1 1/8"
400 16"	200 8"			
500 20"	250 10"	8 5/16	40 1 5/8"	40 1 5/8"
600 24"	300 12"			

282 A/1278

SLIDING CALIPERS FOR FORESTERS for measuring timber diameters. The end of the ruler is provided with a wooden handle. The ruler is graduated in 0,5 cms. The surface is coated with khaki varnish.

FÖRSTERSCHIEBLEHRE aus Eisen zur Bemessung von Rundholz. Mit 1/2 cm Teilung und Holzgriff. Oberfläche mit Khaki-Lack bespritzt.

PIED-À-COULISSE DE FORESTIER pour mesurer le diamètre des troncs d'arbres. L'extrémité de la règle est munie d'une poignée en bois. La surface est vernie au pistolet en couleur vert olive. Graduation en 0,5 cm.

MEDIDAS PARA GUARDABOSQUES CON REGLA CONTINUA para medir diámetros de troncos de árboles. El extremo de la regla está equipado con mango de madera. Superficie barnizada en color kaki. División de 0,5 cm.

Meßbereich / portée de mesure / longitud de medición / Measuring range	400 mm 16"	600 mm 24"	800 mm 32"	1000 mm 40"
Gewicht / poids / peso / Weight	1,20 kg 2/10 lbs	1,50 kg 3/4 3/4 lbs	1,95 kg 4/4 5/8 lbs	2,10 kg 4/10 lbs

VIALS · LIBELLEN · FIOLES · NIVELES

283 A/816 A

WOODEN WATER LEVEL, with brass trimings and two vials.

HÖLZERNE WASSERWAAGE mit Messingbeschlag und zwei kleinen Libellen.

NIVEAU D'EAUX en bois, avec garnitures en laiton à deux fioles.

NIVELES DE MADERA herradas de latón con dos ampollas.

Größe / grandeur / tamaño / size	20 8"	25 10"	30 12"	35 14"	40 16"	45 18"	50 20"	55 22"	60 24"	70 28"	80 32"	90 36"	100 cm 40"
Gewicht / poids / peso / weight	38 –/13 3/8	43 –/15	48 1/13/16	56 1/3 3/4	67 1/7 5/8	78 1/11 1/2	89 1/15 3/8	100 dkg 2/3 1/4 lbs					
Gewicht / poids / peso / weight	123 2/11 1/4	140 3/12 3/4	175 3/13 5/8	198 4/5 3/4	210 dkg 4/9 7/8 lbs								

283 A/

WOODEN WATER LEVEL, with brass trimings and one vial.

HÖLZERNE WASSERWAAGE mit Messingbeschlag und mit einer kleinen Libelle.

NIVEAU D'EAUX en bois, avec garnitures en laiton et une fiole.

NIVELES DE MADERA herradas de latón con una ampolla.

Größe / grandeur / tamaño / size	10 4"	15 6"	20 8"	25 10"	30 cm 12"
Gewicht / poids / peso / weight	8 2/ 13/16	13 4 1/2	19 6 3/4	28 9 7/8	38 dkg 13 3/8 ozs

284 A/816 B

WOODEN WATER LEVEL, with brass triming and two vials, reinforced with two brass rods.

HÖLZERNE WASSERWAAGE mit zwei kleinen Libellen und Messingbeschlag, versteift durch zwei Messingstangen.

NIVEAU D'EAUX, a deux fioles, en bois avec garnitures en laiton, renforcé de deux tiges, en laiton.

NIVELES DE MADERA de dos ampollas herradas de latón reforzada con dos varillas de latón.

Größe / grandeur / tamaño / size	20 8"	25 10"	30 12"	35 14"	40 16"	45 18"	50 cm 20"
Größe / grandeur / tamaño / size	55 22"	60 24"	70 28"	80 32"	90 36"	100 cm 40"	
Gewicht / poids / peso / weight	45 1/	55 1/3 3/8	70 1/8 5/8	86 1/11 1/4	98 2/2 1/2	106 2/5 5/16	123 dkg 2/11 1/4 lbs
Gewicht / poids / peso / weight	134 2/15 1/8	156 3/6 7/8	178 3/14 5/8	189 4/2 1/2	204 4/7 3/4	234 dkg 5/2 3/8 lbs	

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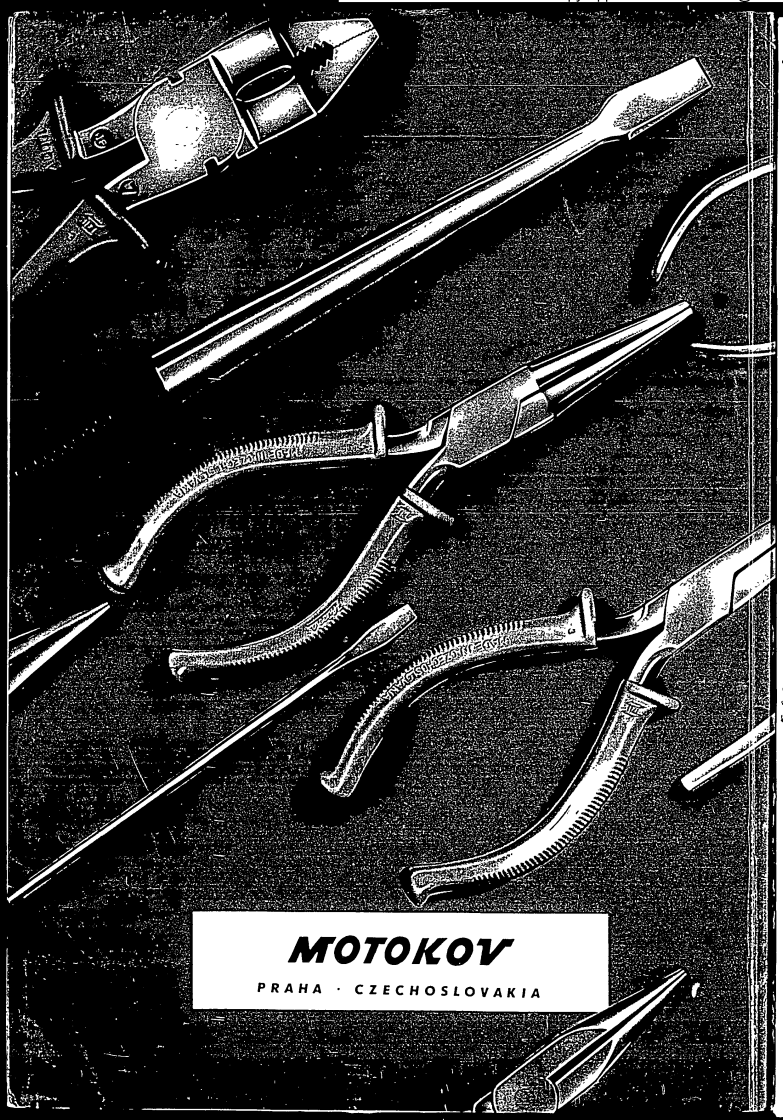

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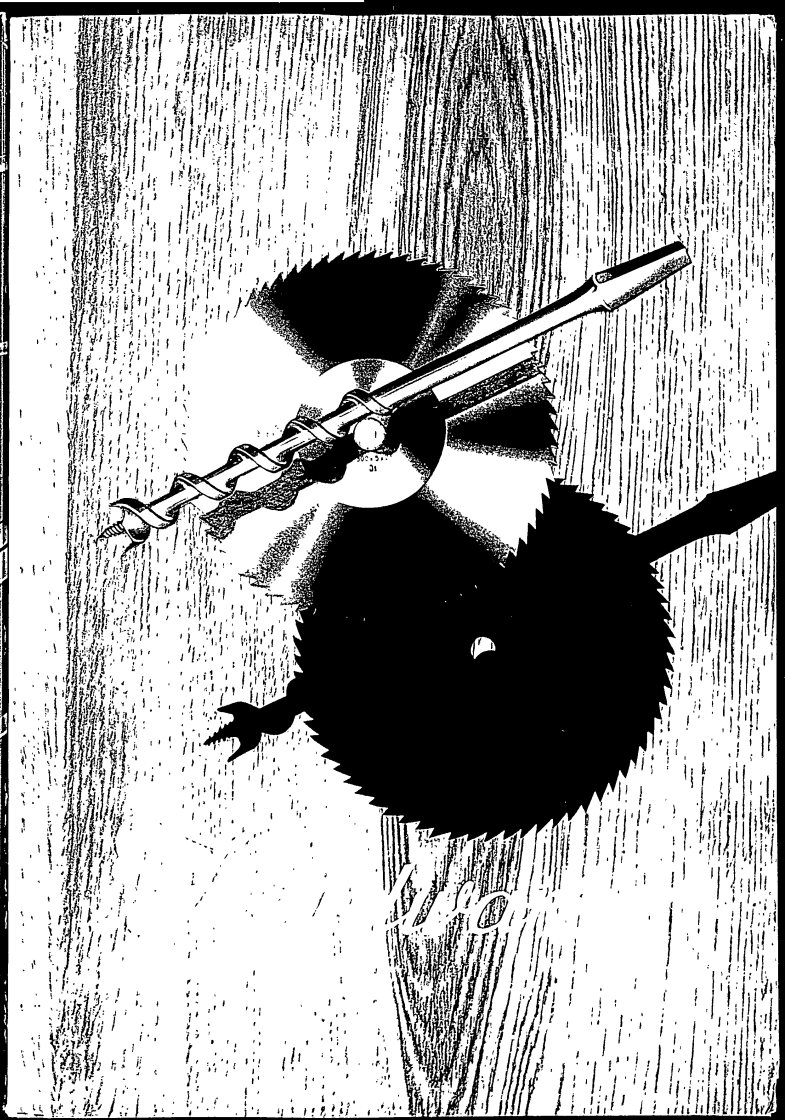

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Hardware B

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NOTICE

As we are steadily improving the construction and design of our products, the illustrations and specifications of this pamphlet are not binding.

HINWEIS

Alle unsere Erzeugnisse unterliegen ständiger Verbesserung und Vervollkommnung. Wir behalten uns deshalb das Recht technischer, im Verlauf des Verbesserungsfortschrittes sich ergebender Änderungen aller angeführten Erzeugnisse vor. Die Angaben dieses Prospektes sind daher unverbindlich.

AVIS

Nos produits étant constamment perfectionnés les renseignements du présent prospectus sont donnés sans engagement.

ADVERTENCIA

Siendo la construcción de nuestros productos objeto de constantes mejoras y perfeccionamientos, las especificaciones insertadas en este prospecto son meramente informativas y sin compromiso alguno de parte nuestra.

CROSS CUT SAWS · BAUCHSÄGEN · PASSE-PARTOUTS · TRONZADORES

with removables handles — mit abnehmbaren Griffen — avec manches à enlever — con mangos desmontables

CROSS CUT SAW V-TEETH of high quality alloy material. The blade ends carried out for removable handles. The teeth in form of an isosceles triangle, set and sharpened.

ZUGSÄGE MIT V-ZAHNUNG aus legiertem Qualitätsmaterial. Die Enden der Blätter für abnehmbare Griffe durchgeführt. Die Zahnung in Form eines gleichschenkligen Dreiecks, geschränkt und geschärft.

SCIE PASSE-PARTOUT, DENTURE EN V, matériel allié de qualité. Les bouts de la lame executés pour les manches à enlever. La denture en forme d'un triangle isocèle, à voie et affutée.

TRONZADOR, DIENTES FORMA V, material aleado de calidad. Las estremidades de la hoja ejecutadas para mangos desmontables. Los dientes en forma de triángulo isósceles, triturados y afilados.

1 B/1112

length / Länge / longueur / largura	inches	3'11"	4'7"	5'3"
	mm	1,200	1,400	1,600
weight / Gewicht / poids / peso	lbs	2/5	3/6	3/15
	kgs	1,05	1,54	1,78

Packing: in bundles per 10 pieces / Verpackung: in Bündeln à 10 Stück / Emballage: en faisceaux à 10 pièces / Embalaje: en atados de 10 piezas

CROSS CUT SAW AMERICAN PATTERN of alloy material. The convergence diminishes the out-friction. The group of teeth is composed of 2 sawing teeth and 1 planing tooth, set and sharpened.

WALDSÄGE — AMERIKANISCHE FORM aus legiertem Material. Die Konvergenz vermindert die Schnittreibung. Gruppenzahnung von 2 Schneidzähnen und 1 Hobelzahn, zusammengesetzt, geschränkt und geschärft.

SCIE PASSE-PARTOUT, FAÇON AMERICAINE, matériel allié. La convergence diminue la friction de la coupe. La denture en groupes se compose de 2 dents à couper et 1 à raboter, à voie et affutée.

TRONZADOR MODELO AMERICANO, material aleado. La convergencia reduce la fricción del corte. Los dientes en grupos consisten en 2 dientes para cortar y 1 diente acepilladór.

2 B/1118

length / Länge / longueur / largura	inches	4'7"	5'3"	5'11"
	mm	1,400	1,600	1,800
weight / Gewicht / poids / peso	lbs	4/14	5/12	6/8
	kgs	2,22	2,60	2,95

Packing: in bundles per 10 pieces / Verpackung: in Bündeln à 10 Stück / Emballage: en faisceaux à 10 pièces / Embalaje: en atados de 10 plzas

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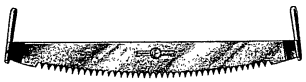
3 B/1122



CROSS CUT SAW, V-TEETH AND WOODEN HANDLES of alloy material, the blades ending with riveted eyes for handles of hard wood. The teeth in the form of triangle, set and sharpened.

ZUGSÄGE MIT V-ZAHNUNG UND HOLZGRIFFEN, aus legiertem Material, an den Enden des Blattes angenietete Augen für Holzgriffe aus hartem Holz. Die Zahnung in Form eines gleicharmigen Dreiecks, geschränkt und geschärft.

SCIE PASSE-PARTOUT DENTURE V AVEC MANCHES EN BOIS, matériel allié, aux bouts se trouvent rivées les douilles pour manches en bois dur. La denture en forme du triangle, à voie et affutée.

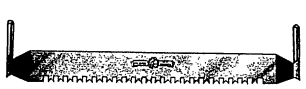
TRONZADOR DIENTES V CON MANGOS DE MADERA, Material aleado, la hoja acabada por cubos remachados para mangos de madera dura. Los dientes en forme de triángulo, trabajados y afilados.

length	inches	3'11"	4'7"	5'3"
Länge / longueur / largura	mm	1,200	1,400	1,600
weight	lbs	2/9	3/10	4/3
Gewicht / poids / peso	kgs	1,15	1,65	1,90

Packing: in bundles per 10 pieces / Verpackung: in Bündeln à 10 Stück / Emballage: en faisceaux à 10 pièces / Embalaje: en atados de 10 piezas

According the wish of the customer we can furnish also saws in length 5'11" — 6'7".
Nach dem Wunsche des Kundens liefern wir auch die Sägen in Längen von 1800 — 2000 mm.
Selon le désir du client nous livrons aussi les scies dans longueurs 1,800 — 2,000 mm.
Según deseo del cliente entregamos también las sierras en larguras 1,800—2,000 mm.

4 B/1190



CROSS CUT SAW WITH GROOVING TEETH AND WOODEN HANDLES of alloy material, with riveted eyes for handles of hard wood. The teeth set and sharpened. The width of the blade is the same all the length.

ZUGSÄGE MIT NUTENZAHNUNG UND HOLZGRIFFEN, aus legiertem Material mit angenieteten Augen für Hartholzgriffe. Die Zahnung geschränkt und geschärft. Die Breite des Blattes ist dieselbe auf der ganzen Länge.

SCIE PASSE-PARTOUT — AVEC DENTURE À RAINER ET MANCHE EN BOIS. Matériel allié, douilles rivées pour la manche en bois dur. La denture à voie et affutée. L'épaisseur de la lame est la même sur toute la longueur.

TRONZADOR CON DIENTES PARA RANURAR Y MANGOS DE MADERA. Material aleado con cubos remachados para mangos de madera dura. Los dientes trabajados y afilados. La anchura de la hoja la misma sobre largura entera.

length	inches	3'11"	4'7"	5'3"
Länge / longueur / largura	mm	1,200	1,400	1,600
weight	lbs	2/13	4/1	4/10
Gewicht / poids / peso	kgs	1,28	1,85	2,10

Packing: in bundles per 10 pieces / Verpackung: in Bündeln à 10 Stück / Emballage: en faisceaux à 10 pièces / Embalaje: En atados de 10 piezas

CROSS CUT SAW WITH V-TEETH AND WOODEN HANDLES of alloy material with riveted eyes for handles of hard wood. Triangular teeth are set and sharpened.

ZUGSÄGE MIT V-ZAHNUNG UND HOLZGRIFFEN, aus legiertem Material mit angenieteten Augen für Hartholzgriffe. Dreieckzahnung, geschränkt und geschärft.

SCIE PASSE-PARTOUT AVEC DENTURE V ET MANCHES EN BOIS. Matériel allié, douilles rivées pour la manche en bois dur. La denture triangulaire est à voie et affutée.

TRONZADOR CON DIENTES V Y MANGOS DE MADERA. Material aleado con cubos remachados para mangos de madera dura. Los dientes triangulares trabajados y afilados.

5 B/1182

length	inches	3'11"	4'7"	5'3"
Länge / longueur / largura	mm	1,200	1,400	1,600
weight	lbs	2/13	4/1	4/10
Gewicht / poids / peso	kgs	1,28	1,85	2,10

Packing: in bundles per 10 pieces / Verpackung: in Bündeln à 10 Stück / Emballage: en faisceaux à 10 pièces / Embalaje: en atados de 10 piezas

CONSERVATION – TOOLS FOR SAWS · ERHALTUNGSWERKZEUGE FÜR SÄGEN · OUTILS DE CONSERVATION POUR SCIES · HERRAMIENTAS DE CONSERVACIÓN PARA SIERRAS

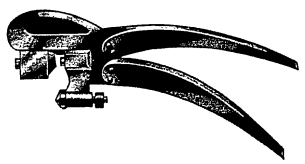
SAW SET PLIERS FOR CROSS CUT AND SPAN WEB SAWS.

SCHRÄNKZANGEN FÜR ZUG- UND SPANNSÄGEN.

PINCES À VOIE POUR SCIES PASSE-PARTOUTS ET À TENON.

TENAZAS TRABADORES PARA TRONZADORES Y SIERRAS DE CARPINTEROS.

8 B/591



weight	lbs	2/7
Gewicht / poids / peso	kgs	1,21

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CROSS CUT SAW HANDLES · ZUGSÄGENGRIFFE · MANCHES POUR PASSE-PARTOUTS · MANGOS PARA TRONZADORES

TURNING HANDLES TO CROSS CUT SAWS. The handles of hard wood, screw and wings of cast iron, against rust protected by paint.

DREHGRIFFE ZU ZUGSÄGEN. Griff aus hartem Holz, Schraube und Flügel aus Gußeisen, gegen Rost durch Farbe geschützt.

MANCHES TOURNABLES POUR SCIES PASSE-PARTOUTS. La manche de bois dur, le vis et les torelles en fonte, protégés contre rouille par la teinture.

MANGOS DE ROTACIÓN PARA TRONZADORES. El mango de madera dura, el tornillo y las orejas de hierro colado, protegido contra de la herrumbre por la tinta.

11 B/2111

PILANA

Weight / Gewicht / poids / peso: oz 9 / kgs 0,25

Packing: in cardboard box per 10 pieces / Verpackung: im Pappschachtelin à 10 Stück / Emballage: en boites de carton à 10 pièces / Embalaje: en cartónes de 10 piezas

12 B/2113

SCREWING HANDLES FOR CROSS CUT SAWS. Handles of hard wood, iron screw of steel.

SCHRAUBENGRIFFE ZU ZUGSÄGEN. Griffe aus Hartholz, die Schraube aus Stahl.

MANCHES POUR PASSE-PARTOUTS, AVEC VIS. La manche en bois dur, le vis d'acier.

MANGOS PARA TRONZADORES CON TORNILLO. El mango de madera, el tornillo de acero.

PILANA

Weight / Gewicht / poids / peso: oz 7 / kgs 0,19

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BOW SAWS · BÜGELSÄGEN · SCIES À BÛCHES À ARCHET · SIERRAS PARA TRONCOS CON ARMAZÓN

BOW SAW WITH STRAINING LEVER AND BLADE WITH V-TEETH. The bow of the saw of profile-tube, ensuring perfect strain of the blade in the cut. The blade is fastened by 2 rivets and straining lever. The change of blade is easy. The toothing in form of isosceles triangle, set and sharpened.

BÜGELSÄGE MIT SPANNHEBEL UND BLATT MIT V-ZAHNUNG. Der Sägebügel aus Profilröhre, welche vollendete Spannung des Blattes bei dem Schnitt versichert. Das Sägeblatt mit 2 Nieten und Spannhebel befestigt. Leicht auswechselbar. Die Zahnung in Form eines gleicharmigen Dreiecks, geschränkt und geschärft.

SCIE À BÛCHES À ARCHET, AVEC LEVIER DE TENSION ET LAME À DENTURE V. L'archet de la scie de tube profilée assurant la tension parfaite de la lame dans la coupe. La lame de scie est saisie par 2 rivets et le levier de tension. Facilement à remplacer. La denture en forme de triangle isocèle, à voie et affutée.

SIERRA PARA TRONCOS CON ARMAZÓN Y PALANCA DE TENSIÓN, HOJA CON DIENTES V. La palanca en tubo de perfil, asegurando la tensión perfecta de la hoja en el corte. La hoja sujetada por 2 remaches y palanca de tensión. Recambio facil; los dientes en forma de triángulo isósceles, trabajados y afilados.

13 B/469

length	inches	*28″*	*31″*	*35″*	*39″*
Länge / longueur / largura	mm	700	800	900	1000
height	inches	*11″*	*11″*	*11″*	*11″*
Höhe / hauteur / altura	mm	270	270	270	270
weight	lbs	*2/14*	*3/1*	*3/5*	*3/10*
Gewicht / poids / peso	kgs	1,31	1,40	1,51	1,64
height	inches	*13″*	*13″*	*13″*	*13″*
Höhe / hauteur / altura	mm	320	320	320	320
weight	lbs	*3*	*3/3*	*3/7*	*3/12*
Gewicht / poids / peso	kgs	1,35	1,45	1,57	1,69

Packing: bundles per 10 pieces, packed in fluted cardboard / Verpackung: Bündel à 10 Stück, mit Wellkarton umgepackt / Emballage: faisceaux à 10 pièces, emballés en carton ondulé / Embalaje: atados de 10 piezas, embalados en cartón ondeado.

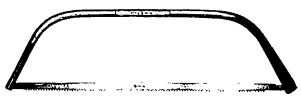
BOW SAW WITH STRAINING LEVER AND CONVERGENT BLADE, V-TOOTHING.

BÜGELSÄGE MIT SPANNHEBEL UND KONVERGENZBLATT MIT V-ZAHNUNG.

SCIE À BÛCHES, À ARCHET, AVEC LEVIER DE TENSION, LAME CONVERGENTE, DENTURE V.

SIERRA PARA TRONCOS, CON ARMAZÓN PALANCA DE TENSIÓN Y HOJA CONVERGENTE, DIENTES FORMA V.

14 B/469 N



length	inches	*28″*	*31″*	*35″*	*39″*
Länge / longueur / largura	mm	700	800	900	1000
height	inches	*11″*	*11″*	*11″*	*11″*
Höhe / hauteur / altura	mm	270	270	270	270
weight	lbs	*2/14*	*3/1*	*3/5*	*3/10*
Gewicht / poids / peso	kgs	1,31	1,40	1,51	1,64
height	inches	*13″*	*13″*	*13″*	*13″*
Höhe / hauteur / altura	mm	320	320	320	320
weight	lbs	*3*	*3/3*	*3/7*	*3/12*
Gewicht / poids / peso	kgs	1,35	1,45	1,57	1,69

Packing: bundles per 10 pieces, packed in fluted cardboard / Verpackung: Bündel à 10 Stück, mit Wellkarton umgepackt / Emballage: faisceaux à 10 pièces, emballés en carton ondulé / Embalaje: atados de 10 piezas, embalados en cartón ondeado

BOW SAW WITH STRAINING LEVER AND CONVERGENT BLADE, TEETH IN GROUPS. The saw-bow of profile-tube. The blade fastened by 2 rivets and strained by straining lever.

BÜGELSÄGE MIT SPANNHEBEL UND KONVERGENZBLATT, GRUPPENZAHNUNG. Der Sägebügel aus Profilröhre. Das Sägeblatt durch 2 Nieten gehalten und mit Spannhebel gespannt.

SCIE À BÛCHES, À ARCHET, AVEC LEVIER DE TENSION ET LAME CONVERGENTE, DENTS GROUPÉES. L'archet de la scie en tube profilée. La lame de la scie saisie par 2 rivets et tendue par le levier de tension.

SIERRA PARA TRONCOS CON ARMAZÓN, PALANCA DE TENSIÓN Y HOJA CONVERGENTE, DIENTES EN GRUPOS. El armazón en tubo de perfil. La hoja de la sierra sujetada por 2 remaches y estirada por la palanca de tensión.

15 B/470 N

length	inches	*20″*	*31″*	*35″*	*39″*
Länge / longueur / largura	mm	700	800	900	1000
height	inches	*11″*	*11″*	*11″*	*11″*
Höhe / hauteur / altura	mm	270	270	270	270
weight	lbs	*2/14*	*3/1*	*3/5*	*3/10*
Gewicht / poids / peso	kgs	1,30	1,39	1,50	1,63
height	inches	*13″*	*13″*	*13″*	*13″*
Höhe / hauteur / altura	mm	320	320	320	320
weight	lbs	*3*	*3/3*	*3/7*	*3/11*
Gewicht / poids / peso	kgs	1,35	1,44	1,50	1,68

Packing: bundles per 10 pieces, packed in fluted cardboard / Verpackung: Bündel à 10 Stück, mit Wellkarton umgepackt / Emballage: faisceaux à 10 pièces, emballés en carton ondulé / Embalaje: atados de 10 piezas, embalados en cartón ondeado.

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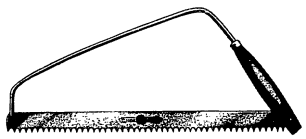
16 B/565



ONE-HAND BOW SAW.

EINHANDBÜGELSÄGE.

SCIE À ARCHET POUR USAGE DOMESTIQUE.

SERRUCHO CON ARMAZÓN PARA USO DOMESTICO.

length Länge / longueur / largura	inches mm	*20"* 500

Packing: bundles per 10 pieces, packed in fluted cardboard / Verpackung: Bündel à 10 Stück, mit Wellkarton umgepackt / Emballage: faisceaux à 10 pièces, emballés en carton ondulé / Embalaje: atados de 10 piezas, embalados en cartón ondeado

PILANA

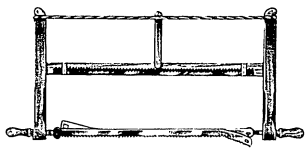
FOLDING WEB SAW. Practical, easy to be disassembled. Furnished with 3 saw-blades: normal, chair and with fine teeth.

ZUSAMMENLEGBARE TISCHLERSÄGE. Praktisch, leicht auseinanderlegbar. Mit 3 Blättern versehen: Tischler-, Schweif- und Absatzblatt.

SCIE PLIANTE POUR MENUSIERS. Pratique, facile à démonter. Munie de 3 lames: de menuisier, à chantourner, à araser.

SIERRA PLEGABLE PARA CARPINTEROS. Práctica, desmontable sin esfuerzo. Provelda de 3 hojas: para carpinteros, para rodear y enrasar.

18 B/560



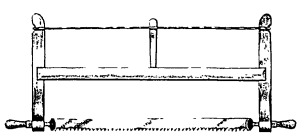
length Länge / longueur / largura	inches mm	*24"* 600
weight Gewicht / poids / peso	lbs grs	*1/7* 650

PILANA

Packing: bundles per 10 pieces, packed in fluted cardboard / Verpackung: Bündel à 10 Stück, mit Wellkarton umgepackt / Emballage: faisceaux à 10 pièces, emballés en carton ondulé / Embalaje: atados de 10 piezas, embalados en cartón ondeado

JOINERS' SAWS · TISCHLERSÄGEN · SCIES POUR MENUISIERS · SIERRAS PARA CARPINTEROS

17 B/1552



SPAN WEB SAW. The blade at both ends provided by tangs (solid or riveted) and through them fastened to the frame.

TISCHLERSPANNSÄGE. Das Sägeblatt an beiden Enden mit Angeln (festen oder genieteten) versehen und dadurch zum Rahmen befestigt.

SCIE À TENON. La lame pourvu à tous les deux bouts par les queues (naturelles ou rivées) et attachée ainsi au tenon.

SIERRA PARA CARPINTEROS. La hoja provelda a ambos cabos de espigas (naturales o remachadas) y fijada por las mismas al armazón.

length Länge / longueur / largura	inches mm	*24"* 600	*28"* 700	*31"* 800	*35"* 900
width Breite / largeur / anchura	inches mm	*1'7"* 40	*1'7"* 40	*1'7"* 40	*1'7"* 40
weight Gewicht / poids / peso	lbs grs	*1/12* 780	*1/15* 870	*2/3* 1000	*2/5* 1055

Packing: bundles per 10 pieces, packed in fluted cardboard / Verpackung: Bündel à 10 Stück, mit Wellkarton umgepackt / Emballage: faisceaux à 10 pièces, emballés en carton ondulé / Embalaje: atados de 10 piezas, embalados en cartón ondeado

PILANA

SAW BLADES · SÄGEBLÄTTER · LAMES DE SCIES · HOJAS DE SIERRAS

26 B/514

BOW SAW BLADE, with V toothing and distance of teeth 5"'; the sides of saw blades are polished. The teeth set and sharpened.

BÜGELSÄGEBLATT mit V-Zahnung und Zahnweite 10 mm. Die Seiten des Blattes poliert. Die Zahnung geschränkt und geschärft.

LAME DE SCIE À BÛCHES, DENTURE V, distance des dents 10 mm. Les côtés de la lame sont polis. La denture à voie et affutée.

HOJA DE SIERRA PARA TRONCOS, dientes forma V, distancia de dientes 10 mm. Los lados de la hoja son pulidos. Los dientes trabajados y afilados.

length Länge / longueur / largura	inches mm	*28"* 700	*31"* 800	*35"* 900	*39"* 1000
weight Gewicht / poids / peso	oz grs	*3 1/2* 100	*4* 115	*4 1/2* 130	*6* 168

PILANA

Packing: bundles per 10, 50 and 100 pieces / Verpackung: Bündel à 10, 50 und 100 Stück / Emballage: faisceaux à 10, 50 et 100 pièces / Embalaje: atados de 10, 50 y 100 piezas

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27 B/514 N

CONVERGENT BOW SAW BLADE with V toothing and teeth distance 3‴, set and sharpened. The thickness of material on the back is thinner than in the teeth.

BÜGELSÄGEBLATT, KONVERGIEREND mit V-Zahnung und Zahnweite 10 mm, geschränkt und geschärft. Die Dicke des Materials des Rückens ist schwächer als in den Zähnen.

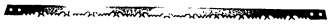
LAME DE SCIE À BÛCHES, CONVERGENTE, DENTURE V. Distance des dents 10 mm, à voie et affutée. L'épaisseur du matériel plus mince sur le dos que sur la denture.

HOJA DE SIERRAS PARA TRONCOS, CONVERGENTE, dientes forma V, distancia de dientes 10 mm, trabajados y afilados. El grueso de material más delgado en lomo que sobre las dientes.

length	inches	*28″*	*31″*	*35″*	*39″*	
Länge / longueur / largura	mm	700	800	900	1000	
weight	oz	*3*	*4*	*4 1/2*	*5 1/2*	
Gewicht / poids / peso	grs	90	108	121	157	

Packing: bundles por 10, 50 and 100 pieces / Verpackung: Bündel à 10, 50 und 100 Stück / Emballage: faisceaux à 10, 50 et 100 pièces Embalaje: atados de 10, 50 y 100 piezas

28 B/519 N



BOW SAW BLADE WITH COMBINATION TOOTHING. The convergent blade is thinner on the back than in the teeth. The toothing has 4 cutting and 1 planing tooth. Set and sharpened.

BÜGELSÄGEBLATT MIT GRUPPENZAHNUNG. Das Konvergenzblatt ist schmäler am Rücken als in den Zähnen. Die Zahnungsgruppe besteht aus 4 Schneidezähnen und 1 Hobelzahn. Geschränkt und geschärft.

LAMES POUR SCIES À BÛCHES, AVEC DENTS GROUPÉS. La lame convergento est plus mince en dos que sur les dents. La denture se compose de 4 dents à couper et 1 dent à raboter. À voie et affutée.

HOJA DE SIERRAS PARA TRONCOS CON DIENTES EN GRUPOS. La hoja convergente es más delgada en lomo que sobre los dientes. El grupo consiste en 4 dientes para cortar y 1 diente acepillador. Trabajados y afilados.

length	inches	*28″*	*31″*	*35″*	*39″*	
Länge / longueur / largura	mm	700	800	900	1000	
weight	oz	*3 1/2*	*4*	*4 1/2*	*6*	
Gewicht / poids / peso	grs	100	115	130	168	

Packing: bundles por 10, 50 and 100 pieces / Verpackung: Bündel à 10, 50 und 100 Stück / Emballage: faisceaux à 10, 50 et 100 pièces / Embalaje: atados de 10, 50 y 100 piezas

29 B/521

SPAN WEB BLADE with solid tangs. Produced of polished cold-rolled material. The teeth in form of a not isosceles triangle with teeth distance 2‴.

SPANNSÄGEBLATT mit festen Angeln. Erzeugt aus poliertem, kaltgewalztem Material. Die Zahnung in Form eines nicht gleicharmigen Dreiecks, Zahnweite 2 mm.

LAME DE SCIES À TENON, queues naturelles. Fabriquée en matériel poli, laminé en froid. La denture en forme d'un triangle non isocèle, distance des dents 2 mm.

HOJA DE SIERRAS PARA CARPINTEROS. Con espigas naturales, producida de material pulido, laminado en frío. Los dientes en forma de triángulo no isósceles, distancia de dientes 2 mm.

weight	oz	*3*	*4*	*4 1/2*	*5 1/2*	
Gewicht / poids / peso	grs	90	110	130	150	
width	inches	*1 5/8″*	*1 5/8″*	*1 5/8″*	*1 5/8″*	
Breite / largeur / anchura	mm	40	40	40	40	
length	inches	*24″*	*28″*	*31″*	*35″*	
Länge / longueur / largura	mm	600	700	800	900	

Packing: bundles per 25, 50 or 100 pieces / Verpackung: Bündel à 25, 50 oder 100 Stück / Emballage: faisceaux à 25, 50 ou 100 pièces / Embalaje: atados de 25, 50 o 100 piezas

30 B/522

TENON SAW BLADE with solid tangs. Produced of polished cold-rolled material. The teeth in form of a not isosceles triangle with teeth distance 3‴.

ABSATZSÄGEBLATT mit festen Angeln. Erzeugt aus poliertem, kaltgewalztem Material. Die Zahnung in Form eines nicht gleicharmigen Dreiecks, Zahnweite 3 mm.

LAME DE SCIE À ARASER, queues naturelles. Fabriquée en matériel poli, laminé en froid. La denture en forme d'un triangle non isocèle, distance des dents 3 mm.

HOJA DE SIERRAS PARA ENRASAR. Con espigas naturales, producida de material pulido, laminado en frío. Los dientes en forma de triángulo no isósceles, distancia de dientes 3 mm.

weight	oz	*3*	*4*	*4 1/2*	*5 1/2*	
Gewicht / poids / peso	grs	90	110	130	150	
width	inches	*1 5/8″*	*1 5/8″*	*1 5/8″*	*1 5/8″*	
Breite / largeur / anchura	mm	40	40	40	40	
length	inches	*24″*	*28″*	*31″*	*35″*	
Länge / longueur / largura	mm	600	700	800	900	

Packing: bundles per 25, 50 or 100 pieces / Verpackung: Bündel à 25, 50 oder 100 Stück / Emballage: faisceaux à 25, 50 ou 100 pièces / Embalaje: atados de 25, 50 o 100 piezas

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31 B/523

CHAIR WEB SAW BLADE polished, with teeth in form of a not isosceles triangle. On both sides round hole for fastening.

SCHWEIFSÄGEBLATT, poliert, mit Zahnung in Form eines nicht gleicharmigen Dreiecks. An beiden Seiten runde Öffnungen für Zuhalten.

LAME DE SCIE POUR CHANTOURNER, polie. La denture en forme d'un triangle non isocèle. Tous les deux bouts munis par ouverture ronde pour accrocher.

HOJA DE SIERRA PARA RODEAR, pulida, los dientes en forma de triángulo no isósceles. Ambos lados proveídos de abertura redonda para suspender.

length	inches	*24"*	*28"*	*32"*	*36"*
Länge / longueur / largura	mm	600	700	800	900
width	inches	*4"*	*4"*	*4"*	*4"*
Breite / largeur / largura	mm	8	8	8	8
weight	oz	*4/7*	*2/3*	*6/7*	*1*
Gewicht / poids / peso	grs	17	20	24	27
width	inches	*5"*	*5"*	*5"*	*5"*
Breite / largeur / anchura	mm	10	10	10	10
weight	oz	*2/3*	*6/7*	*1*	*1 1/2*
Gewicht / poids / peso	grs	20	25	27	30
width	inches	*6"*	*6"*	*6"*	*6"*
Breite / largeur / anchura	mm	12	12	12	12
weight	oz	*6/7*	*1 1/7*	*1 2/7*	*1 1/2*
Gewicht / poids / peso	grs	26	31	36	41
width	inches	*7"*	*7"*	*7"*	*7"*
Breite / largeur / anchura	mm	15	15	15	15
weight	oz	*1 1/7"*	*1 3/7"*	*1 4/7"*	*1 5/7"*
Gewicht / poids / peso	grs	32	39	45	50

Packing: bundles per 10, 50 and 100 pieces / Verpackung: Bündel à 10, 50 und 100 Stück / Emballage: faisceaux à 10, 50 et 100 pièces / Embalaje: atados de 10, 50 y 100 piezas

32 B/524

UNHINGING CHAIR WEB SAW BLADE. Polished, with teeth in form of a not isosceles triangle. One side with round hole for fastening, other with rectangular hole for unhinging hook.

AUSHÄNGESÄGEBLATT, poliert, mit Zahnung in Form eines nicht gleicharmigen Dreiecks. Einerseits mit Rundöffnung zum Zuhalten, andererseits mit Rechtecköffnung für Aushängehaken.

LAME POUR SCIE À DÉPENDRE, polie. La denture en forme d'un triangle non isocèle. Un côté avec ouverture rondo pour accrocher, l'autre avec ouverture rectangulaire pour crochet à dépendre.

HOJA DE SIERRA PARA DESCOLGAR. Pulida, los dientes en forma de triángulo no isósceles. Un lado con abertura redonda para suspender, el otro con abertura rectangular para corchete á descolgar.

for length of web saw	inches	*24"*	*28"*	*31"*	*35"*
für Tischlersägelänge	mm	600	700	800	900
pour longueur de la scie de menusier					
para largura de la sierra para carpinteros					
length of blade	inches	*21"*	*25"*	*29"*	*33"*
Blattlänge / longueur de la lame					
largura de la hoja	mm	537	637	737	837
width	inches	*4"*	*4"*	*4"*	*4"*
Breite / largeur / anchura	mm	8	8	8	8
weight	oz	*1/2*	*4/7*	*5/7*	*6/7*
Gewicht / poids / peso	grs	15	18	22	25
width	inches	*5"*	*5"*	*5"*	*5"*
Breite / largeur / anchura	mm	10	10	10	10
weight	oz	*4/7*	*5/7*	*6/7*	*1*
Gewicht / poids / peso	grs	17	22	24	27
width	inches	*6"*	*6"*	*6"*	*6"*
Breite / largeur / anchura	mm	12	12	12	12
weight	oz	*6/7*	*1*	*1 1/7*	*1 2/7*
Gewicht / poids / peso	grs	23	28	33	38
width	inches	*7"*	*7"*	*7"*	*7"*
Breite / largeur / anchura	mm	15	15	15	15
weight	oz	*1*	*1 2/7*	*1 1/2*	*1 4/7*
Gewicht / poids / peso	grs	28	35	41	45

Packing: bundles per 25, 50 or 100 pieces / Verpackung: Bündel à 25, 50 oder 100 Stück / Emballage: faisceaux à 25, 50 ou 100 pièces / Embalaje: atados de 25, 50 o 100 piezas

33 B/525

SPAN WEB SAW BLADE WITH RIVETED TANGS. The teeth in form of a not isosceles triangle with teeth distance 2".

SPANNSÄGEBLATT MIT NIETANGELN. Die Zahnung in Form eines nicht gleicharmigen Dreiecks, Zahnweite 5 mm.

LAME DE SCIE À TENON À QUEUES RIVÉES. La denture en forme d'un triangle non isocèle, distance des dents 5 mm.

HOJA DE SIERRA PARA CARPINTEROS CON ESPIGAS REMACHADAS. Los dientes en forma de triangulo no isósceles, distancia de dientes 5 mm.

length of blade	inches	*24"*	*28"*	*31"*	*35"*
Blattlänge / longueur de la lame	mm	600	700	800	900
largura de la hoja					
weight	oz	*4 1/4*	*5*	*5 2/3*	*6 1/2*
Gewicht / poids / peso	grs	120	140	160	180
width	inches	*1 5/8"*	*1 5/8"*	*1 5/8"*	*1 5/8"*
Breite / largeur / anchura	mm	40	40	40	40

Packing: bundles per 25, 50 or 100 pieces / Verpackung: Bündel à 25, 50 oder 100 Stück / Emballage: faisceaux à 25, 50 ou 100 pièces / Embalaje: atados de 25, 50 o 100 piezas

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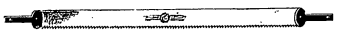
34 B/527



TENON SAW BLADE with riveted tangs. The teeth in form of a not isosceles triangle with teeth distance 1"'.

ABSATZSÄGEBLATT mit Nietangeln. Die Zahnung in Form eines nicht gleicharmigen Dreiecks. Zahnweite 3 mm.

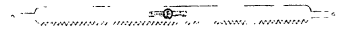
LAME DE SCIE À ARASER à queues rivées. La denture en forme d'un triangle non isocèle, distance des dents 3 mm.

HOJA DE SIERRAS PARA ENRASAR con espigas remachadas. Los dientes en forma de triángulo no isósceles, distancia de dientes 3 mm.

length of blade	inches	*24"*	*28"*	*31"*	*35"*
Blattlänge / longueur de la lame / largura de la hoja	mm	600	700	800	900
width	inches	*1 5/8"*	*1 5/8"*	*1 5/8"*	*1 5/8"*
Breite / largeur / anchura	mm	40	40	40	40
weight	oz	*4 1/4*	*5*	*5 3/3*	*6 1/2*
Gewicht / poids / peso	grs	120	140	160	180

Packing: bundles per 25, 50 or 100 pieces / Verpackung: Bündel à 25, 50 oder 100 Stück / Emballage: faisceaux à 25, 50 ou 100 pièces / Embalaje: atados de 25, 50 o 100 piezas

35 B/528



CARPENTER SAW BLADE WITH SOLID TANGS. The teeth in form of isosceles triangle with teeth distance 6"'. The tangs and blade of one piece.

ZIMMERMANNSÄGEBLATT MIT FESTEN ANGELN. Die Zahnung in Form eines gleicharmigen Dreiecks mit Zahnweite 6 mm. Die Angeln und das Blatt aus einem Stück.

LAME DE SCIE POUR CHARPENTIER, À QUEUES NATURELLES, La denture en forme d'un triangle isocèle avec distance des dents 6 mm. Les queues et la lame d'une pièce.

HOJA DE SIERRA PARA CARPINTEROS CON ESPIGAS NATURALES. Los dientes en forma de triángulo isósceles, con distancia de dientes 6 mm. Las espigas y la hoja de la misma pieza.

length of blade	inches	*24"*	*28"*	*31"*	*35"*
Blattlänge / longueur de la lame / largura de la hoja	mm	600	700	800	900
width	inches	*1 5/8"*	*1 5/8"*	*1 5/8"*	*1 5/8"*
Breite / largeur / anchura	mm	40	40	40	40
weight	oz	*3*	*4*	*4 1/2*	*5 1/2*
Gewicht / poids / peso	grs	90	110	130	150

Packing: bundles per 25, 50 or 100 pieces / Verpackung: Bündel à 25, 50 oder 100 Stück / Emballage: faisceaux à 25, 50 ou 100 pièces / Embalaje: atados de 25, 50 o 100 piezas

36 B/529

TENON SAW BLADE with riveted tangs. The teeth in form of a not isosceles triangle with teeth distance 2"'.

ABSATZSÄGEBLATT mit Nietangeln. Die Zahnung in Form eines nicht gleicharmigen Dreiecks, Zahnweite 6 mm.

LAME DE SCIE À ARASER a queues rivées. La denture en forme d'un triangle non isocèle, distance des dents 6 mm.

HOJA DE SIERRAS PARA ENRASAR con espigas remachadas. Los dientes en forma de triángulo no isósceles, distancia de dientes 6 mm.

length of blade	inches	*24"*	*28"*	*31"*	*35"*
Blattlänge / longueur de la lame / largura de la hoja	mm	600	700	800	900
width	inches	*1 5/8"*	*1 5/8"*	*1 5/8"*	*1 5/8"*
Breite largeur / anchura	mm	40	40	40	40
weight	oz	*4 1/4*	*5*	*5 2/3*	*6 1/2*
Gewicht / poids / peso	grs	120	140	160	180

Packing: bundles per 25, 50 or 100 pieces / Verpackung: Bündel à 25, 50 oder 100 Stück / Emballage: faisceaux à 25, 50 ou 100 pièces / Embalaje: atados de 25, 50 o 100 piezas

37 B/533

UNHINGING HOOK FOR UNHINGING CHAIR WEB SAWS. Fastens the unhinging blade and is riveted on the tang of the strainng frame.

AUSHÄNGEHAKEN FÜR AUSHÄNGESCHWEIF-SÄGEN befestigt das Aushängeblatt und wird zu der Angel des Spannbügels genietet.

CROCHET À DÉPENDRE POUR LE SCIES À CHANTOURNER ET DÉPENDRE. Il saisie la lame à dépendre et se trouve rivé à la queue de tenon de tension.

CORCHETE A DESCOLGAR, PARA LAS SIERRAS PARA RODEAR Y DESGOLGAR. Sostiene la hoja para descolgar y es remachado a la espiga de armazón de tensión.

weight	oz	*5/7*
Gewicht / poids / peso	grs	20

Packing: per 50 pieces in cardboard-box / Verpackung: à 50 Stück in Pappschachteln / Emballage: à 50 pièce en boite de carton / Embalaje: à 50 piezas en cartón

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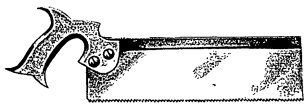
BACK SAWS, SLITTING SAWS AND STAIR BUILDERS' SAWS · RÜCKSÄGEN, FEINSÄGEN UND GRATSÄGEN · SCIES À DOS, POUR ÉBÉNISTES, À CRÊTE – SERRUCHOS DE COSTILLA, PARA ESPIGAS Y MUESCAS

45 B/535



BACK SAW WITH OPENED HANDLE. The blade on upper part reinforced by back. The wooden handle joined fast with blade by screws or rivets. The teeth of the blade have a form of an isosceles triangle.

RÜCKSÄGE MIT OFFENEM GRIFF. Das Sägeblatt ist auf der oberen Seite durch den Rücken verstärkt. Der Holzgriff mit dem Blatt durch Schrauben oder Nieten fest verbunden. Die Zahnung des Blattes hat die Form eines gleicharmigen Dreiecks.

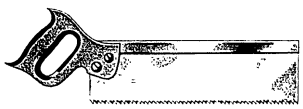
SCIE À DOS À MANCHE OUVERTE. La lame est renforcée sur sa partie supérieure par le dos. La manche en bois liée forme avec la lame par les vis ou rivets. La denture de la lame a la forme d'un triangle isocèle.

SERRUCHO DE COSTILLA CON MANGO ABIERTO. La hoja fortificada en su parte superior por la costilla. El mango de madera juntado de manera fija con la hoja por los tornillos o remaches. Los dientes de la hoja tienen la forma de triángulo isósceles.

length / Länge / longueur / largura	inches	*10"*	*12"*	*14"*	
	mm	250	300	350	
weight / Gewicht / poids / peso	oz	*11 5/7*	*13*	*14 2/7*	
	grs	328	364	399	

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boite de carton / Embalaje: á 10 piezas en cartón

46 B/535 B



BACK SAW WITH CLOSED HANDLE. The blade on upper part reinforced by back. The wooden handle joined fast with blade by screws or rivets. The teeth of the blade have a form of an isosceles triangle.

RÜCKSÄGE MIT GESCHLOSSENEM GRIFF. Das Sägeblatt ist auf der oberen Seite durch den Rücken verstärkt. Der Holzgriff mit dem Blatt durch Schrauben oder Nieten fest verbunden. Die Zahnung des Blattes hat die Form eines gleicharmigen Dreiecks.

SCIE À DOS À MANCHE FERMÉE. La lame est renforcée sur sa partie supérieure par le dos. La manche en bois liée forme avec la lame par les vis ou rivets. La denture de la lame a la forme d'un triangle isocèle.

SERRUCHO DE COSTILLA CON MANGO CERRADO. La hoja fortificada en su parte superior por la costilla. El mango de madera juntado de manera fija con la hoja por los tornillos o remaches. Los dientes de la hoja tienen la forma de triángulo isósceles.

length / Länge / longueur / largura	inches	*10"*	*12"*	*14"*	
	mm	300	350	400	
weight / Gewicht / poids / peso	oz	*15*	*16 3/4*	*18 1/2*	
	grs	419	470	518	

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boite de carton / Embalaje: á 10 piezas en cartón

HAND SAW WITH OPENED HANDLE WITHOUT BACK. The blade with teeth in triangular shape. The wooden handle screwed or riveted to the blade.

HANDSÄGE MIT OFFENEM GRIFF OHNE RÜCKEN. Das Sägeblatt hat eine dreieckige Zahnung. Der Holzgriff ist zu dem Blatt verschraubt oder genietet.

SCIE À MAIN À MANCHE OUVERTE, SANS DOS. La lame a la denture de forme triangulaire. La manche en bois vissée ou rivée avec la lame.

SERRUCHO DE MANO CON MANGO ABIERTO SIN COSTILLA. La hoja tiene los dientes triangulares. El mango de madera atornillado o remachado con la hoja.

47 B/537

length / Länge / longueur / largura	inches	*8"*	*12"*	*14"*	
	mm	200	300	350	
weight / Gewicht / poids / peso	pc	oz	*7 1/2*	*8 2/7*	*10*
	1 St	grs	212	233	280
	pz				

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boite de carton / Embalaje: á 10 piezas en cartón

HAND SAW WITH CLOSED HANDLE WITHOUT BACK. The blade has the toothing in form of a not isosceles triangle with 8 teeth upon 1". The wooden handle screwed or riveted to the blade.

HANDSÄGE MIT GESCHLOSSENEM GRIFF OHNE RÜCKEN. Das Blatt hat die Zahnung in Form eines nicht gleicharmigen Dreiecks mit 8 Zähnen auf 25,4 mm. Der Holzgriff ist zu dem Blatt verschraubt oder genietet.

SCIE À MAIN À MANCHE FERMÉE SANS DOS. La lame a la denture en forme du triangle non isocèle avec 8 dents par 25,4 mm. La manche en bois vissée ou rivée avec la lame.

SERRUCHO DE MANO CON MANGO CERRADO SIN COSTILLA. La hoja tiene los dientes en forma de triángulo no isósceles con 8 dientes por 25,4 mm. El mango de madera atornillado o remachado con la hoja.

48 B/538/IV

length / Länge / longueur / largura	inches	*16"*	*18"*	*20"*	*22"*	*24"*	
	mm	400	400	500	550	600	
weight / Gewicht / poids / peso	pc	oz	*12 2/7*	*14*	*15 2/7*	*20 1/2*	*22 1/7*
	1 St	grs	345	394	427	573	621
	pz						

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boite de carton / Embalaje: á 10 piezas en cartón

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49 B/539

COMPASS SAW. The blade has the toothing in form of a not isosceles triangle. The wooden handle screwed or riveted to the blade.

STICHSÄGE. Das Blatt hat die Zahnung in Form eines nicht gleicharmigen Dreiecks. Der Holzgriff ist zu dem Blatt verschraubt oder genietet.

SCIE À GUICHET. La lame a la denture en forme du triangle non isocèle. La manche en bois vissée ou rivée avec la lame.

SERRUCHO DE PUNTA. La hoja tiene los dientes en forma de triángulo no isósceles. El mango de madera atornillado o remachado con la hoja.

length	inches	*10"*	*12"*	*14"*
Länge / longueur / largura	mm	250	300	350
weight	oz	*5 2/3*	*6 1/2*	*7 1/2*
Gewicht / poids / peso	grs	160	180	210

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boîte de carton / Embalaje: á 10 piezas en cartón

50 B/537 T

HAND SAW WITH OPENED HANDLE-TURKISH PATTERN. The wooden handle of special form for backward cut. The blade has the toothing in form of a not isosceles triangle.

HANDSÄGE MIT OFFENEM GRIFF — TÜRKISCHE FORM. Der Holzgriff hat spezielle Form für Schnitt rückwärts. Das Blatt hat die Zahnung in Form eines nicht gleicharmigen Dreiecks.

SCIE À MAIN AVEC MANCHE OUVERTE — FAÇON TURQUE. — La manche en bois a une forme speciale pour le coup en arrière. La lame a la denture en forme du triangle non isocèle.

SERRUCHO DE MANO CON MANGO ABIERTO — MODELO TURCO. El mango de madera tiene una forma particular para el corte hacia atrás. La hoja tiene los dientes en forma de triángulo no isósceles.

length	inches	*10"*	*12"*	*14"*
Länge / longueur / largura	mm	250	300	350
weight	oz	*8 4/7*	*9*	*9 2/7*
Gewicht / poids / peso	grs	240	250	260

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boîte de carton / Embalaje: á 10 piezas en cartón

COMPASS SAW — TURKISH PATTERN. The wooden handle of special form for backward cut. The blade has the toothing in form of a not isosceles triangle and is fast joined with the handle by screws or rivots.

STICHSÄGE — TÜRKISCHE FORM. Der Holzgriff hat spezielle Form für Schnitt rückwärts. Das Blatt hat die Zahnung in Form eines nicht gleicharmigen Dreiecks und ist mit dem Griff durch Schrauben oder Nieten fest verbunden.

SCIE À GUICHET — FAÇON TURQUE. La manche en bois a une forme specielle pour le coup en arrière. La lame a la denture en forme d'un triangle non isocèle et se trouve liée ferme avec la manche par les vis ou rivets.

SERRUCHO DE PUNTA — MODELO TURCO. El mango de madera tiene una forma particular para el corte hacia atrás. La hoja tiene los dientes en forma de triángulo no isósceles y es juntado de manera fija con el mango por los tornillos o remaches.

51 B/539 T

length	inches	*8"*	*10"*	*12"*	*14"*
Länge / longueur / largura	mm	200	250	300	350
weight	pc	oz	*3 5/7*	*3 3/4*	*5 3/7*	*7 2/7*
Gewicht / poids / peso	1 St pz	grs	102	105	152	205

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boîte de carton / Embalaje: à 10 piezas en cartón

52 B/541

SLITTING SAW — STRAIGHT PATTERN. With fine teeth in form of a not isosceles triangle. The wooden handle is fastened to the extended end of the back.

FEINSÄGE MIT GERADEM GRIFF. Feine Zahnung in Form eines nicht gleicharmigen Dreiecks. Der Holzgriff ist auf das verlängerte Ende des Rückens aufgesetzt.

SCIE À DOS POUR ÉBÉNISTES, MODÈLE DROIT. Avec denture fine en forme du triangle non isocèle. La manche en bois est imposée sur l'extremité prolongée du dos.

SIERRA PARA ESPIGAS CON MANGO RECTO. Dientes finos en forma de triángulo no isósceles. El mango de madera es puesto sobre el cabo alargado de costilla.

length	inches	*9"*
Länge / longueur / largura	mm	225
weight	pc	oz	*5 1/2*
Gewicht / poids / peso	1 St pz	grs	155

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boîte de carton / Embalaje: á 10 piezas en cartón

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53 B/542

SLITTING SAW WITH CRANKED HANDLE and fine teeth in form of a not isosceles triangle. The wooden handle cranked to one side of blade.

FEINSÄGE MIT GEBOGENEM GRIFF und feiner Zahnung, in Form eines nicht gleicharmigen Dreiecks. Der Holzgriff zu einer Seite des Blattes gekröpft.

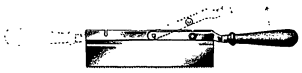
SCIE À DOS POUR ÉBÉNISTES À MANCHE COURBÉE avec denture fine en forme du triangle non isocèle. La manche en bois renvoyée envers un coté de la lame.

SIERRA PARA ESPIGAS CON MANGO DOBLADO y dientes finos en forma de triángulo no isósceles. El mango de madera doblado para un lado de la hoja.

length Länge / longueur / largura		inches mm	*9"* 225
weight Gewicht / poids / peso	pc 1 St pz	oz grs	*6 6/7* 120

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Embalago: à 10 pièces en boite de carton / Embalaje: á 10 piezas en cartón

54 B/543



SLITTING SAW, REVERSIBLE. The blade reinforced on its upper end by back. The teeth of the blade in form of an isosceles triangle. The handle is reversible from the right to the left side.

UMLEGBARE FEINSÄGE. Das Blatt ist auf seiner oberen Seite durch den Rücken verstärkt. Die Zahnung des Blattes in Form eines gleicharmigen Dreiecks. Der Griff ist von der rechten Seite zu der linken umkippbar.

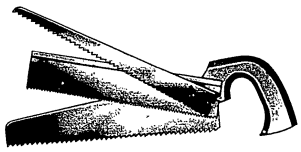
SCIES À DOS POUR ÉBÉNISTES, À MANCHE REVERSIBLE. La lame renforcée sur la partie supérieure par le dos. La denture de la lame en forme d'un triangle isocèle La manche est reversible de coté droit à gauche.

SIERRA PARA ESPIGAS CON MANGO REVERSIBLE. La hoja fortificada en su parte superior por la costilla. Los dientes de la hoja en forma de triángulo isósceles. El mango es reversible de la parte derecha á la izquierda.

length Längo / longueur / largura		inches mm	*9"* 225
weight Gewicht / poids / peso		oz grs	*8 3/7* 236

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballago: à 10 pièces en boite de carton / Embalajo: á 10 piezas en cartón

55 B/555



NEST OF SAVS WITH 3 BLADES. Consists of wooden handle and 3 exchangeables blades: compass saw, slitting saw and normal hand saw. The blades are fastened in the handle by turning tight the fly-screw.

NESTSÄGE MIT 3 BLÄTTERN besteht aus dem Holzgriff und 3 auswechselbaren Blättern: Stichsäge, Feinsäge und normale Handsäge. Die Blätter werden in dem Griff durch Festziehen der Flügelschraube befestigt.

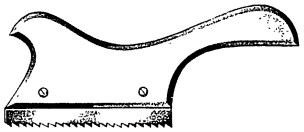
SCIE À 3 LAMES se compose de la manche en bois et 3 lames échangeables: scie à guichet, scie pour ébénistes et scie à main normale. Les lames sont fixées dans la manche par le vissage d'écrou à oreilles.

JUEGO DE SERRUCHOS CON 3 HOJAS consisto del mango de madera y 3 hojas cambiables: sierra de punta, sierra de espigas y serrucho de mano normal. Las hojas están sujetadas en el mango apretando la tuerca á orejas.

length Länge / longueur / largura		inches mm	*10"* 250	*12"* 300
weight of set Gewicht der Garnitur / poids de jeu / peso de juego		oz grs	*13* 370	

Packing: per 5 pieces in cardboard-box / Verpackung: à 5 Stück in Pappschachteln / Emballage: à 5 pièces en boite de carton / Embalajo: á 5 piezas en cartón

56 B 544



STAIR BUILDERS' SAW. The blade has the toothing in form of a not isosceles triangle. The wooden handle screwed or riveted to the blade.

GRATSÄGE. Das Blatt hat die Zahnung in Form eines nicht gleicharmigen Dreiecks. Der Holzgriff ist zu dem Blatt verschraubt oder genietet.

SCIE À CRÊTE. La lame a la denture en forme du triangle non isocèle. La manche en bois vissée ou rivée avec la lame.

SIERRA DE MUESCAS. La hoja tiene los dientes en forma do triángulo no isósceles. El mango de madera atornillado o remachado con la hoja.

length Längo / longueur / largura		inches mm	*6 1/8"* 155
weight Gewicht / poids / peso	pc 1 St pz	oz grs	*8* 230

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boite de carton / Embalajo: á 10 piezas en cartón

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VENEER SAWS AND SUPPLEMENTARY BLADES · FOURNIERSCHNEIDER UND ERSATZBLÄTTER · COUPES - PLACAGES ET LAMES DE RECHANGE · CORTADORES DE ENCHAPADO Y HOJAS DE REPUESTO

67 B/545

VENEER SAW. The saw blade has the teeth on both convex sides. On one side have the teeth the form of isosceles triangle, on the other of a not isosceles one, both toothing having the distance of teeth 3/32".

FOURNIERSCHNEIDER. Das Sägeblatt hat die Zahnung auf den beiden konvexen Seiten. Auf einer Seite hat die Zahnung die Form eines gleicharmigen Dreiecks, auf der anderen eines nicht gleicharmigen. Beide Zahnungen mit Zahnweite 2 mm.

COUPE-PLACAGES. La lame de la scie est dentée sur tous les deux côtés convexes. La denture sur une coté a la forme d'un triangle isocèle, sur l'autre non isocèle. Toutes les deux dentures avec distance des dents 2 mm.

CORTADOR DE ENCHAPADO. La hoja del serrucho tiene dientes sobre ambos lados convexos. Sobre un lado tienen los dientes la forma de triángulo isósceles, sobre el otro no isósceles. Ambos dientes con distancia de 2 mm.

length of blade Länge des Blattes / longueur de la lame / largura de hoja	inches mm	3" 75
weight Gewicht / poids / peso	oz grs	1/2 100

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boite de carton / Embalaje: á 10 piezas en cartón

68 B 546

SUPPLEMENTARY BLADE FOR VENEER SAW. The saw blade has the teeth on both convex sides. On one side have the teeth the form of isosceles triangle, on the other of a not isosceles one, both toothing having the distance of teeth 3/32".

ERSATZBLATT ZUM FOURNIERSCHNEIDER. Das Sägeblatt hat die Zahnung auf den beiden konvexen Seiten. Auf einer Seite hat die Zahnung die Form eines gleicharmigen Dreiecks, auf der anderen eines nicht gleicharmigen. Beide Zahnungen mit Zahnweite 2 mm.

LAME DE RECHANGE POUR COUPE-PLACAGES. La lame de la scie est dentée sur les deux côtés convexes. La denture sur un côté a la forme d'un triangle isocèle, sur l'autre non isocèle. Toutes les deux dentures avec distance des dents 2 mm.

HOJA DE REPUESTO PARA CORTADOR DE ENCHAPADO. La hoja del serrucho tiene dientes sobre ambos lados convexos. Sobre un lado tienen los dientes la forma de triángulo isósceles, sobre el otro no isósceles. Ambos dientes con distancia de 2 mm.

length Länge / longueur / largura	inches mm	3" 75
weight Gewicht / poids / peso	oz grs	1/2 14

Packing: bundles per 25 or 50 pieces / Verpackung: Bündel à 25 oder 50 Stück / Emballage: fasceaux à 25 ou 50 pièces / Embalaje: atados de 25 o 50 piezas

GARDENERS' SAWS · GÄRTNERSÄGEN · SCIES POUR JARDINIERS · SIERRAS PARA JARDINEROS

PRUNING SAW "BOKUL" with stretching screw and turning blade, having triangular teeth, symmetrical or not, fastened on one side in the frame by conical pulling piece, on the other side by such piece with thread and screw-nut, stretching the mentioned blade. Relaxing the screw-nut we can turn easily the blade. The handle of wood, the frame of flat material, sprayed by varnish.

BAUMSÄGE „BOKUL" mit Spannschraube und drehbarem Sägeblatt von einer symmetrischen oder unsymmetrischen Dreieckform. Das Blatt befestigt auf einer Seite durch einen kegelförmigen Zugansatz, auf der anderen durch Zugansatz mit Gewinde und Schraubenmutter, mit welcher das Blatt gespannt wird. Beim Nachlassen der Schraubenmutter können wir mit dem Blatt leicht drehen. Der Griff aus Holz, der Bügel aus flachem, mit Farbe bespritztem Material.

SCIE À GREFFER "BOKUL" avec vis de tension et une lame tournable, denture triangulaire symétrique ou non, et saisie dans l'archet d'un côté par un support de traction conique, d'autre par support avec pas de vis et écrou, pour tendre la lame par le dernier. En desserant l'écrou on peut tourner facilement la lame. La manche en bois, l'archet du matériel plat, couvert par la peinture.

SERRUCHO PARA INJERTAR "BOKUL" con tornillo de tensión y hoja de vuelta, que tiene los dientes triángulares, simétricos o no y está sujetado sobre un lado por pieza de tracción cónica, sobre el otro par pieza con filete y tuerca para tender la hoja. Dejando la tuerca podemos volver facilmente la hoja. El mango de madera, el armazón de material chato, rociado por tinta.

72 B/623

length of Blade Länge des Blattes / longueur de la lame / largura de hoja		inches mm	12" 300
weight Gewicht / poids / peso	pc 1 St. pz	lbs grs	1/2 3/4 530

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boite de carton / Embalaje: á 10 piezas en cartón

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73 B/603

PRUNING SAW WITH STRETCHING SCREW. The frame of round polished material, the blade has triangular teeth, symmetrical or not, and is stretched in the frame by fly-screw. The handle of wood.

BAUMSÄGE MIT EINER SPANNSCHRAUBE. Der Bügel aus rundem poliertem Material; das Sägeblatt hat eine Dreieckform, symmetrisch oder nicht, und wird in dem Bügel durch Flügelschraube gespannt. Griff aus Holz.

SCIE À GREFFER À UN VIS DE TENSION. L'archet de matériel rond et poli, la lame a la forme trianguläre, symétrique ou non; tendue dans l'archet par un écrou à oreilles. Manche en bois.

SERRUCHO PARA INJERTAR CON UN TORNILLO DE TENSIÓN. El armazón de material redondo y pulido, la hoja tiene una forma triangular, simétrica o no, y está tendida en el armazón por la tuerca á orejas. Mango de madera.

length of blade Länge des Blattes / longueur de la lame / largura de hoja	inches mm	12" 300
weight Gewicht / poids / peso	oz grs	10 280

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boîte de carton / Embalajo: á 10 piezas en cartón

74 B/609

SAW FOR ROSES. The frame of the saw of round polished material. The blade has fine toothing with the distance of teeth of 1" and is fastened to frame by 2 split-pins. The handle of wood.

DIE ROSENSÄGE. Der Bügel der Säge aus rundem poliertem Material. Das Sägeblatt hat feine Zahnung mit Zahnweite 2 mm und ist zu dem Bügel mit 2 Splinten befestigt. Der Griff aus Holz.

SCIE POUR ROSES. L'archet de matériel rond et poli. La lame de scie a une denture fine avec la distance des dents 2 mm; est attachée à l'archet par 2 goupilles. La manche en bois.

SERRUCHO PARA ROSAS. El armazón de material redondo y pulido. La hoja tiene dientes finos con distancia de 2 mm y está sujetada al armazón por 2 pasadores. El mango de madera.

length of blade Länge des Blattes / longueur de la lame / largura de hoja	inches mm	6 1/2" 165
weight Gewicht / poids / peso	oz grs	3 80

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boîte de carton / Embalajo: á 10 piezas en cartón

PRUNING SAW WITH SOCKET AND STRETCHING SCREW. The frame of flat material sprayed by varnish. The blade stretched in frame by help of pull-piece and fly-screw. The socket riveted to the frame by 2 rivets.

75 B/613

BAUMSÄGE MIT DÜLLE UND SPANNSCHRAUBE. Der Bügel aus flachem Material und mit Farbe gespritzt. Das Blatt gespannt in dem Bügel mit Hilfe des Zugansatzes und Flügelschraube. Die Dülle mit 2 Nieten zu dem Bügel genietet.

SCIE À GREFFER, À DOUILLE ET VIS DE TENSION. L'archet de matérial plat et couvert par la peinture. La lame tendue dans l'archet à l'aide de support de traction et un écrou à oreilles. La douille rivée sur l'archet par 2 rivets.

SERRUCHO PARA INJERTAR CON CUBO Y TORNILLO DE TENSIÓN. El armazón de material chato y rociado por tinta. La hoja tendida en el armazón con ayudo de pieza de tracción y tuerca á orejas. El cubo remachado al armazón por 2 remaches.

length of blade Länge des Blattes / longueur de la lame / largura de hoja	inches mm	12" 300
weight Gewicht / poids / peso	oz grs	13 1/2 380

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boîte de carton / Embalajo: á 10 piezas en cartón

PRUNING SAW WITH SOCKET. The blade of polished material, the teeth in form of a not isosceles triangle. The socket of steel, both parts joined together with 2 rivets.

76 B/617

GÄRTNERSÄGE MIT DÜLLE. Das Blatt aus poliertem Material, die Zahnung in Form eines nicht gleicharmigen Dreiecks. Die Dülle aus Stahl, beide Teile durch 2 Nieten zusammen verbunden.

SCIE DE JARDINIER AVEC DOUILLE. La lame de matériel poli, la denture en forme d'un triangle non isocèle. La douille d'acier; toutes les deux parties jointes ensemble par 2 rivets.

SERRUCHO PARA PODAR CON CUBO. La hoja de material pulido, los dientes en forma de triángulo no isósceles. El cubo de acero; ambas partes unidas completamente por 2 remaches.

length of blade Länge des Blattes / longueur de la lame / largura de hoja	inches mm	12" 300	14" 350
weight Gewicht / poids / peso	1 pc 1 St 1 pz	oz grs	6 3/4 190

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boîte de carton / Embalajo: á 10 piezas en cartón

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77 B/620

PRUNING SAW WITH PISTOL HANDLE. The blade has the teeth in form of an isosceles triangle and is screwed or riveted to the handle.

GÄRTNERSÄGE MIT PISTOLENHEFT. Das Blatt hat die Zahnung in Form eines nicht gleicharmigen Dreiecks und ist zu dem Griff geschraubt oder genietet.

SCIE DE JARDINIER À MANCHE PISTOLET. La lame a la denture en forme d'un triangle non isocèle et elle est rivée ou vissée sur la manche.

SERRUCHO DE PODAR, FORMA DE PISTOLA. La hoja tiene los dientes en forma de triángulo no isósceles y está atornillada o remachada sobre el mango.

length		inches	*10"*	*12"*	*14"*
Länge / longueur / largura		mm	250	300	350
weight	1 pc	oz	*6 1/2*	*8*	*10*
Gewicht / poids / peso	1 St	grs	180	225	285
	1 pz				

78 B/614

SUPPLEMENTARY BLADE FOR PRUNING SAWS with teeth in form of a not isosceles triangle, set and sharpened.

ERSATZBLATT ZU BAUMSÄGEN mit Zahnung in Form eines nicht gleicharmigen Dreiecks, geschränkt und geschärft.

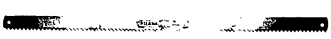
LAME DE RECHANGE POUR SCIES À GREFFER avec denture en forme d'un triangle non isocèle, à voie et affutée.

HOJA DE RECAMBIO PARA SIERRAS PARA INJERTAR con dientes en forma de triángulo isósceles, trabajados y afilados.

length		inches	*12"*
Länge / longueur / largura		mm	300
weight	1 pc	oz	*1*
Gewicht / poids / peso	1 St	grs	30
	1 pz		

Packing: bundles per 25, 50 or 100 pieces / Verpackung: Bündel à 25, 50 oder 100 Stück / Emballage: faisceaux à 25, 50 ou 100 pièces / Embalaje: atados á 25, 50 o 100 piezas

79 B/616



SUPPLEMENTARY BLADE FOR PRUNING SAWS with teeth in form of rectangular triangle, set and sharpened.

ERSATZBLATT ZU BAUMSÄGEN mit Zahnung in Form eines rechtwinkligen Dreiecks, geschränkt und geschärft.

LAME DE RECHANGE POUR SCIES À GREFFER avec denture en forme du triangle rectangulaire, à voie et affutée.

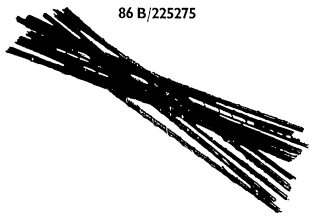
HOJA DE RECAMBIO PARA SIERRAS PARA INJERTAR con dientes en forma de triángulo rectangular, trabajados y afilados.

length		inches	*12"*
Länge / longueur / largura		mm	300
weight	1 pc	oz	*1*
Gewicht / poids / peso	1 St	grs	30
	1 pz		

Packing: bundles per 25, 50 or 100 pieces / Verpackung: Bündel à 25, 50 oder 100 Stück / Emballage: faisceaux à 25, 50 ou 100 pièces / Embalaje: atados á 25, 50 o 100 piezas

PIERCING SAWS · LAUBSÄGEN · SCIES À REPERCER · SEGUETES

86 B/225275



PIERCING SAW FOR WOOD. The teeth performed in the length of 3/8". The piercing saw is without teeth 1" from both sides.

LAUBSÄGE FÜR HOLZ. Die Zahnung in der Länge 80 mm durchgeführt. Die Laubsäge ist ohne Zahnung 25 mm von den beiden Enden.

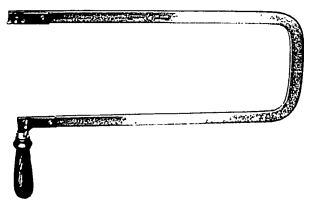
SCIE À REPERCER POUR BOIS. La denture executée dans la longueur de 80 mm. La scie à repercer est sans dents 25 mm de tous les deux bouts.

SEGUETE PARA MADERA. Los dientes ejecutados en la largura de 80 mm. El seguete está sin dientes 25 mm de ambos estremos.

distance of teeth					
Zahnweite / distance des dents / distancia de dientes		mm	0,8	1	1,2
length		inches	*5 1/8"*	*5 1/8"*	*5 1/8"*
Länge / longueur / largura	1 pc	mm	130	130	130
weight	1 St	oz	*3/4*	*3/4*	*3/4*
Gewicht / poids / peso	1 pz	grs	20	20	20

Packing: in bundles per 12 pcs, 12 bundles in cardboard-box / Verpackung: in Bündeln à 12 Stück, 12 Bündel in Pappschachteln / Emballage: en faisceaux à 12 pcs, 12 faisceaux dans boite de carton / Embalaje: en atados de 12 piezas, 12 atados en cartón

87 B/225278



PIERCING SAW FRAME of flat material. At both ends the adapters are riveted. The piercing saw is put between the adapters and fastened with a fly-screw.

LAUBSÄGEBOGEN aus flachem Material. Auf beiden Enden sind Zuhaltungen genietet. Die Laubsäge wird zwischen die Zuhaltungen gelegt und durch eine Flügelschraube zugezogen.

PORTE-SCIE À REPERCER du matériel plat. Sur tous les deux bouts les raccords sont rivés. La scie à repercer est mise entre les raccords et serrée par écrou à oreilles.

ARCO PARA SEGUETES de material chato. Á ambos estremos los suplementos estan remachados. El seguete se pone entre los suplementos y está atrafdo por una tuerca á orejas.

for piercing saws of length		inches	*1/8"*
für Laubsägen von Länge		mm	130
pour scie à repercer de longueur		mm	130
para seguetes de largura		mm	130

Packing: per 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boite de carton / Embalaje: á 10 piezas en cartón

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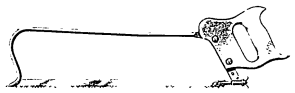
BUTCHERS' SAWS · FLEISCHERSÄGEN · SCIES DE BOUCHER · SIERRAS PARA CARNICEROS

88 B/556



BUTCHER SAW. The blade has triangular teeth and is stretched in the frame by pull-piece and fly-screw. The wooden handle riveted to frame with 2 rivets.

FLEISCHERSÄGE. Das Blatt hat Dreieckzahnung und wird durch Zugansatz und Flügelschraube in dem Bogen gespannt. Der Holzgriff ist zu dem Rahmen mit 2 Nieten genietet.

SCIE DE BOUCHER. La lame a une denture triangulaire et elle est tendue dans l'archet par support de traction et écrou à oreilles. La manche en bois est rivée par 2 rivets sur la monture.

SIERRA PARA CARNICEROS. La hoja tiene los dientes triangulares y está tendida en el arco por pieza de tracción y tuerca á orejas. El mango de madera remachado á la montura por 2 remaches.

length Länge / longueur / largura		inches mm	*18"* 450
weight Gewicht / poids / peso	1 pc 1 St 1 pz	lbs grs	*1/12* 800

Packing: por 10 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boîte de carton / Embalaje: á 10 piezas en cartón

89 B/557

SUPPLEMENTARY BLADES FOR BUTCHERS' SAWS.

ERSATZBLÄTTER FÜR FLEISCHERSÄGEN.

LAMES DE RECHANGE DES SCIES POUR BOUCHERS.

HOJAS DE RECAMBIO DE SIERRAS PARA CARNICEROS.

length Länge / longueur / largura		inches mm	*18"* 450
weight Gewicht / poids / peso	1 pc 1 St 1 pz	oz grs	*1 4/7* 44

HACK SAW BLADES · METALLSÄGEBLÄTTER · LAMES DE SCIE À MÉTAUX HOJAS DE SIERRAS PARA METALES

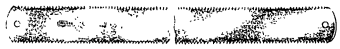
HACK SAW BLADES FOR HAND USE, WITH TEETH ON BOTH ENDS. The surface coloured after heat treatment, the teeth raised and set in wave-line, not set on the lenght of 1" in the spot of fastening holes.

HANDMETALLSÄGEBLÄTTER, DOPPELT. Die Oberfläche nach Wärmebehandlung gefärbt. Die Zahnung gefräst und wellenförmig geschränkt, in dem Ort der Befestigungslöcher in der Länge von 25 mm nicht geschränkt.

LAMES DE SCIE À MÉTAUX À MAIN DOUBLES. La surface colorée après traitement thérmique; les dents fraisés et à voie d'une façon ondulée, dans le lieu des trous à fixer sans voie dans la longueur de 25 mm.

HOJAS DE SIERRAS PARA METALES, PARA USO Á MANO, DE DOS LADOS. La superficie teñida después de tratamiento por calor. Los dientes fresados y trabajados en estilo ondeado, en el lugar de los agujeros para fijar no trabajados en largura de 25 mm.

90 B/583



1. execution of alloy steel—marked
   Ausführung aus legiertem Stahl — markiert
   exécution d'acier trempé — marquée
   exejución de acero templado — marcada — DIAMANT
2. execution of alloy steel, alloyed by chrome
   Ausführung aus legiertem Stahl, mit Chrom legiert
   exécution d'acier trempé par chrome
   exejución de acero templado por cromo — Cr
3. execution of alloy-steel, alloyed by wolfram
   Ausführung aus legiertem Stahl, mit Wolfram legiert
   exécution d'acier trempé par wolfram
   exejución de acero templado por wolfram — W

length Länge / longueur / largura		inches mm	*12"* 300
width Breite / largeur / anchura		inches mm	*1"* 25
number of teeth / Zähneanzahl / quantité des dents / número de dientes			22, 32
thickness Dicke / épaisseur / grueso		mm	0,7
weight Gewicht / poids / peso		oz grs	*1, 3/7* 39

Packing: bundles per 10 pieces, 10 bundles in cardboard-box / Verpackung: Bündel à 10 Stück, 10 Bündel in Pappschachtel / Emballage: faisceaux à 10 pièces, 10 faisceaux dans boîte de carton / Embalaje: atados de 10 piezas, 10 atados en cartón

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91 B/584

DIAMANT	Cr	Wo

HACK SAW BLADES FOR HAND USE, SINGLE. The surface coloured after heat treatment; the teeth fraised and set in wave-line, not set on the lenght of 1" in the spot of fastening holes.

HANDMETALLSÄGEBLÄTTER, EINFACH. Die Oberfläche nach Wärmebehandlung gefärbt. Die Zahnung gefräst und wellenförmig geschränkt, in dem Ort der Befestigungslöcher in der Länge von 25 mm nicht geschränkt.

LAMES DE SCIE À MÉTAUX À MAIN, SIMPLES. La surface colorée après traitement thérmique; les dents fraisés et à voie d'une façon ondulée, dans le lieu des trous à fixer sans voie dans la longueur de 25 mm.

HOJAS DE SIERRAS PARA METALES PARA USO Á MANO, SENCILLAS. La superficie teñida después de tratamiento por calor. Los dientes fresados y trabajados en estilo ondeado, en el lugar de los agujeros para fijar no trabajados en largura de 25 mm.

length Länge / longueur / largura	inches mm	*12"* 300
thickness Dicke / épaisseur / grueso	mm	0,7
width Breite / largeur anchura	inches mm	*19/32"* 15
number of teeth / Zähneanzahl / quantité des dents / número de dientes		16, 18, 22, 32
weight Gewicht / poids / peso	oz grs	*3/4* 22

Packing: bundles per 10 pieces, 10 bundles in cardboard-box / Verpackung: Bündel à 10 Stück, 10 Bündel in Pappschachteln / Emballage: faisceaux à 10 pièces, 10 faisceaux dans boîte de carton / Embalajo: atados de 10 piezas, 10 atados en cartón

92 B/581

HACK SAW FRAME. The blade is fastened in the frame by help of split-pins and stretched with the fly-screw on the front pull-piece. The frame of flat material.

METALLSÄGEBOGEN. Das Blatt ist in dem Bogen mit Hilfe von Splinten befestigt und durch die Flügelschraube auf dem vorderen Zugansatz gespannt. Der Bogen aus flachem Material.

MONTURE DES SCIES À MÉTAUX. La lame est saisse dans la monture avec aide des goupilles et tendue par écrou à oreilles de support de traction de devant. La monture de matériel plat.

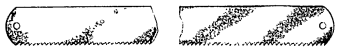
ARCO DE SIERRAS PARA METALES. La hoja está sujetada en la montura con ayudo de pasadores y tendida por la tuerca á orejas de la pieza de tracción delantera.

Size / taille / Größe / tamaño:

length of blade Blattlänge / longueur de la lame / largura de la sierra	inches mm	*12"* 300
weight Gewicht / poids / peso 1 pc,	1 pc 1 St 1 pz	lbs *1/5 1/2* grs 610

Packing: per 5 pieces in cardboard-box / Verpackung: à 10 Stück in Pappschachteln / Emballage: à 10 pièces en boîte de carton / Embalaje: á 10 piezas en cartón

93 B/576



HACK SAW BLADES FOR MACHINE USE, WITH WELDED HIGH SPEED CUTTING TEETH PART. Of tool steel; the surface darkly coloured after heat-treatment or sprayed with grey colour. The teeth fraised, alternately set.

MASCHINENMETALLSÄGEBLÄTTER MIT SCHNELLSCHNEIDEZÄHNENPARTIE GESCHWEISST aus Werkzeugstahl, die Oberfläche dunkel gefärbt nach Wärmebearbeitung oder mit grauer Farbe gespritzt. Die Zähne gefräst, abwechselnd geschränkt.

LAMES À MÉTAUX POUR MACHINES À SCIER AVEC LA PARTIE COUPANTE À GRANDE VITESSE SOUDÉE. La surface colorée d'une nuance foncée après traitement thérmique ou peinte par couleur griso. Les dents fraisés et alternativement à voie.

HOJAS PARA METALES PARA USO EN MÁQUINAS CON LA PARTE DENTADA CORTANDA CON GRAN VELOCIDAD SOLDADA — La superficie teñida del tono oscuro después de tratamiento por calor o rociada por color pardo. Los dientes fresados y alternativamente trabajados.

length Länge longueur	inches	*14"*	*16"*	*18"*	*18"*	*20"*	*22"*	*24"*	*26"*	*28"*
largura	mm	350	400	450	450	500	550	600	650	700
width Breite largeur	inches	*1 3/16"*	*1 3/16"*	*1 3/8"*	*1 3/8"*	*1 5/8"*	*1 5/8"*	*2"*	*2"*	*2 1/8"*
anchura	mm	30	30	35	35	40	40	50	50	55
thickness Dicke épaisseur	inches	*3/32"*	*3/32"*	*3/32"*	*3/32"*	*3/32"*	*3/32"*	*3/32"*	*3/32"*	*1/8"*
grueso	mm	2	2	2	2,5	2,5	2,5	2,5	2,5	3
number of teeth Zähneanzahl quantité des dents número de dientes		6,8,10	4,6,8	4,6,8	4,6,8	4,6	4,6	4,6	4,6	4,6
weight 1 pc Gewicht 1 St poda 1 pc	oz	*4 3/4*	*3 6/7*	*7 2/7*	*7 2/7*	*12*	*13*	*17 1/2*	*20*	*30 1/2*
peso 1 pz	grs	134	164	206	206	334	360	490	557	865

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94 B/574

HACK SAW BLADES FOR MACHINE USE, COMPLETELY HIGH-SPEED CUTTING of tool steel; the surface darkly coloured after heat-treatment or sprayed with gray colour. The teeth fraised, alternately set.

MASCHINENMETALLSÄGEBLÄTTER, GANZ SCHNELLSCHNEIDIG, aus Werkzeugstahl, die Oberfläche dunkel gefärbt nach Wärmebearbeitung oder mit grauer Farbe gespritzt. Die Zähne gefräst, abwechselnd geschränkt.

LAMES À MÉTAUX POUR MACHINES À SCIER, COMPLÉTEMENT COUPANTES À GRANDE VITESSE. La surface colorée d'une nuance foncée après traitement thérmique ou peinte par couleur grise. Les dents fraisés et alternativement à voie.

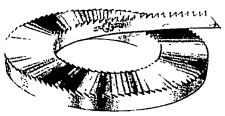
HOJAS PARA METALES PARA USO EN MÁQUINAS COMPLETAMENTE CORTANDOS CON GRAN VELOCIDAD. La superficie teñida del tono oscuro después de tratamiento por calor o rociada por color pardo. Los dientes fresados y alternativamente trabajados.

length	inches	12″	14″	16″	
Länge / longueur / largura	mm	300	350	400	
width	inches	1″	1 3/16″	1 3/16″	
Breite / largeur / anchura	mm	25	30	30	
number of teeth upon 1″ / Zähnoanzahl auf 25 mm / quantité des dents sur 25 mm / número de dientes sobre 25 mm		8, 10, 14	6, 8, 10	6, 8, 10	
thickness	inches	1/32″	1/16″	1/16″	1/16″
Dicke / épaisseur / grueso	mm	0,8	—1,5	1,5	1,5
weight	oz	3 3/7	4 3/4	5 1/2	
Gewicht / poids / peso	grs	96	134	155	

Packing: in bundles per 10 or 12 pieces / Verpackung: in Bündeln à 10 oder 12 Stück / Emballage: en faisceaux à 10 ou 12 pièces / Embalaje: en atados de 10 o 12 piezas

BAND SAWS · BANDSÄGEN · SCIES À RUBAN · SIERRAS DE CINTA

134 B/1708



BAND SAW "SPECIAL", white polished execution.

BANDSÄGE „SPECIAL", weiße, polierte Ausführung.

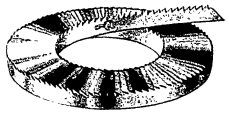
SCIE À RUBAN "SPECIAL", exécution blanche, polie.

SIERRA DE CINTA "SPECIAL", ejecución blanca, pulida.

width inches	1/4″	5/16″	3/8″	15/32″	19/32″	13/16″	1″	13/16″	1 3/8″	15/8″	13/4″	2″
Breite / largeur / anchura mm	6	8	10	12	15	20	25	30	35	40	45	50
thickness inches	1/32″	1/32″	1/32″	1/32″	1/32″	1/32″	1/32″	1/32″	1/32″	1/32″	1/32″	1/32″
Dicke / épaisseur / grueso mm	0,5	0,5	0,6	0,6	0,6	0,6	0,7	0,7	0,7	0,8	0,9	0,9

Packing: in crates / Verpackung: in Holzverschlag / Emballage: en cages / Embalaje: en hunal

135 B/708



BAND SAW "SPECIAL", blue, tempered execution.

BANDSÄGE „SPECIAL", blaue, angelassene Ausführung.

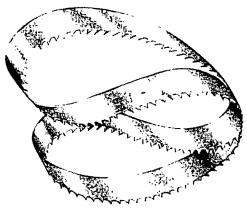
SCIE À RUBAN "SPECIAL", exécution bleue, revenue.

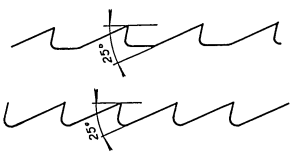
SIERRA DE CINTA "SPECIAL", ejecución azul, revenida.

width inches	1/4″	5/16″	3/8″	15/32″	19/32″	13/16″	1″	1 3/16″	1 3/8″	1 5/8″	1 3/4″	2″
Breite / largeur / anchura mm	6	8	10	12	15	20	25	30	35	40	45	50
thickness inches	1/32″	1/32″	1/32″	1/32″	1/32″	1/32″	1/32″	1/32″	1/32″	1/32″	1/32″	1/32″
Dicke / épaisseur / grueso mm	0,5	0,5	0,6	0,6	0,6	0,6	0,7	0,7	0,7	0,8	0,9	0,9

Packing: in crates / Verpackung: in Holzverschlag / Emballage: en cages / Embalaje: en hunal

136 B/2708





THICK BAND SAW FOR WOOD, manufactured of cold-rolled material. The teeth are set and sharpened. These saws are delivered either in current metres or welded in infinite band.

BLOCKBANDSÄGE FÜR HOLZ aus kaltgewalztem Material erzeugt. Die Zähne geschränkt und geschärft. Die Blocksägen werden geliefert entweder in laufenden Metern oder in endlosen Bändern geschweißt.

SCIE À RUBAN LARGE À BOIS fabriquée de matériel laminé en froid. La denture à voie et affutée. Les scies sont livrées ou en mètres courants ou soudées dans un ruban infini.

SIERRA DE CINTA ANCHA PARA MADERA; producida de material laminado en frío. Los dientes trabajados y afilados. Las sierras están entregadas en metros corrientes o soldadas en cinta sin fin.

V—teeth, Zahnung, denture, dientes.
A—teeth, Zahnung, denture, dientes.

width	inches	3 1/8″	3 1/2″	4″	4 3/4″	5 1/2″	6 1/4″	8″
Breite / largeur / anchura	mm	80	90	100	120	140	160	200
thickness	inches	1/16″	1/16″	1/16″	1/16″	1/16″	1/16″	1/16″
Dicke / épaisseur / grueso	mm	1,1	1,2	1,2	1,2	1,2	1,4	1,6
distance of teeth: inches		1 3/16″	1 3/16″	1 3/8″	1 3/8″	1 5/8″	1 5/8″	1 5/8″
Zahnweite / distance des dents / distancia de dientes		30	30	35	35	40	40	40
weight	oz	26 1/2	29	32	39	48	59	75
Gewicht / poids / peso	grs	740	810	900	1100	1350	1660	2100

Packing: in crates / Verpackung: in Holzverschlag / Emballage: en cages / Embalaje: en hunal

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MACHINE GANG-SAWS BLADES · GATTERSÄGENBLÄTTER · LAMES DE SCIES ALTERNATIVES · HOJAS DE SIERRAS ALTERNATIVAS

137 B/1717

138 B/1719

HORIZONTAL MILL SAW of carbonic tool-steel.
execution: a) hardened in oil
b) hardened in isothermic way.

HORIZONTALGATTERSÄGE aus Werkzeugkohlenstahl.
Ausführung: a) in Öl gehärtet
b) isothermisch gehärtet.

SCIE À EAU HORIZONTALE d'acier carbonique d'outils.
Exécution: a) trempée en huile
b) trempée par méthode isotherme.

SIERRA DE AGUA HORIZONTAL de acero carbónico para herramientas.
Ejecución: a) templado en oleo
b) templado en modo isotérmico.

a) 1717
with symmetrical teeth
mit symmetrischen Zähnen
avec denture symétrique
con dientes simétricos

b) 1719
with combination toothing
mit Gruppenzähnen
avec denture groupée
con dientes en grupos

width Breite / largeur / anchura	inches mm	*4 3/4"* 120	*5 1/2"* 140	*6 1/4"* 160
thickness Dicke / épaisseur / grueso	inches mm	*1/16—3/32"* 1,4; 1,6; 1,8	*3/32"* 1,8	*3/32"* 2
length Länge / longueur / largura	inches mm	*31"—50"* 800—1300	*50"—67"* 1300—1700	*67"—79"* 1700—2000

Packing: in cases / Verpackung: in Kisten / Emballage: dans caisses / Embalaje: en cajas

139 B/1715

VERTICAL GANG SAW.

SENKRECHTE GATTERSÄGE.

SCIE À EAU VERTICALE.

SIERRA DE AGUA VERTICAL.

Dimensions and indications the same as 137 B/1717
Ausmaße und Angaben dieselben wie 137 B/1717
Dimensions et indications les mêmes que 137 B/1717
Dimensiones e indicaciones las mismas que 137 B/1717

Packing: in cases
Verpackung: in Kisten
Emballage: dans caisses
Embalaje: en cajas

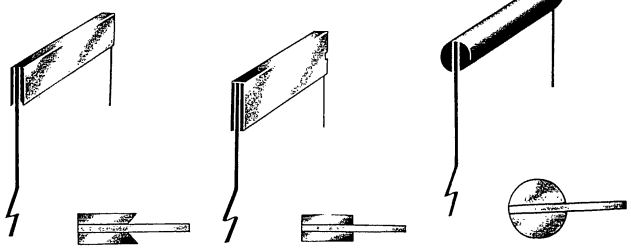
TABS FOR GANG SAWS.

LEISTEN FÜR GATTERSÄGEN.

REBORDS POUR SCIES ALTERNATIVES.

LISTONES PARA SIERRAS ALTERNATIVAS.

140 B/720 **141 B/721** **142 B/722**



720 — slanting
schräg
oblique
obliceo

721 — straight
gerade
droit
derecho

722 — cylindrical
walzenförmig
cylindrique
cilindrico

PIT SAWS · SPALTSÄGEN · SCIES À CRANS · SIERRAS AL AIRE

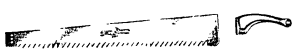
143 B/1710

HAND ICE SAW.

HANDEISSÄGE.

SCIE À MAIN POUR LA GLACE.

SERRUCHO DE MANO PARA HIELO.



length / Länge / longueur / largura:	according order laut Bestellung selon commande según pedido	Packing: in cases Verpackung: in Kisten Emballage: dans caisses Embalaje: en cajas
width / Breite / largeur / anchura:		

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144 B/1711 A

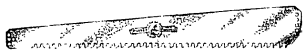
HAND PIT SAW WITH SHARP TEETH.

HANDSPALTSÄGE MIT SPITZZAHNUNG.

SCIE À CRANS À MAIN AVEC DENTURE POINTUE.

SIERRA AL AIRE DE MANO CON DIENTES PUNTIAGUDOS.

145 B/1711 B



HAND PIT SAW WITH A TEETH.

HANDSPALTSÄGE MIT WOLFZAHNUNG.

SCIE À CRANS À MAIN AVEC DENTURE A.

SIERRA AL AIRE DE MANO CON DIENTES A.

length / Länge / longueur / largura:	according order laut Bestellung selon commande	Packing: in cases Verpackung: in Kisten Emballage: dans caisses
width / Breite / largeur / anchura:	según pedido	Embalaje: en cajas

PILANA

SAW CHAINS · SÄGEKETTEN · CHAINES DE SCIES · CADENAS DE SIERRAS

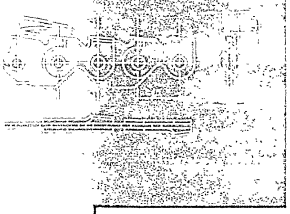
SAW CHAIN MAFFEL of carbonic tool steel.

SÄGEKETTE MAFFEL aus Werkzeugkohlenstahl.

CHAINE DE SCIES MAFFEL d'acier carbonique pour outils.

CADENA DE SIERRAS MAFFEL de acero carbónico para herramientas.

152 B/225355



PILANA

length of cut	inches	20″	22″	24″
Schnittlänge / longueur de coup / largura de corte	mm	500	550	600

Packing: 1 piece in a box / Verpackung: 1 Stück in Schachtel / Emballage: 1 pièce en boîte / Embalaje: 1 pieza en cajita

SAW CHAIN MP 56 of carbonic tool steel.

SÄGEKETTE MP 56 aus Werkzeugkohlenstahl.

CHAINE DE SCIES MP 56 d'acier carbonique pour outils.

CADENA DE SIERRAS MP 56 de acero carbónico para herramientas.

153 B/225353

PILANA

length of cut	inches	24″	32″	40″
Schnittlänge / longueur de coup / largura de corte	mm	600	800	1000

Packing: 1 piece in a box / Verpackung: 1 Stück in Schachtel / Emballage: 1 pièce en boîte / Embalaje: 1 pieza en cajita

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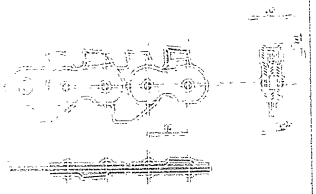
154 B/225354

SAW CHAIN JMP 54 of carbonic tool steel.
SÄGEKETTE JMP 54 aus Werkzeugkohlenstahl.
CHAINE DE SCIES JMP 54 d'acier carbonique pour outils.
CADENA DE SIERRAS JMP 54 de acero carbónico para herramientas.



length of cut Schnittlänge / longueur de coup / largura de corte	inches	16"
	mm	400

Packing: 1 piece in a box / Verpackung: 1 Stück in Schachtel / Emballage: 1 pièce en boîte / Embalaje: 1 pieza en cajita

155 B/225350

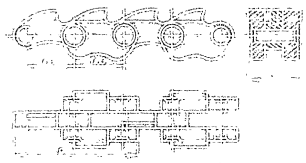
SAW CHAIN RINCO of carbonic tool steel.
SÄGEKETTE RINCO aus Werkzeugkohlenstahl.
CHAINE DE SCIES RINCO d'acier carbonique pour outils.
CADENA DE SIERRAS RINCO de acero carbónico para herramientas.

length of cut Schnittlänge / longueur de coup / largura de corte	inches	24"	32"	40"
	mm	600	800	1000
thickness of links Gliederdicke / épaisseur des maillons / grueso de eslabones	inches	1/16"—1/8"		
	mm	1,6—2,8		

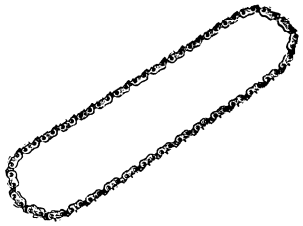
Packing: 1 piece in a box / Verpackung: 1 Stück in Schachtel / Emballage: 1 pièce en boîte / Embalaje: 1 pieza en cajita

MORTISE CHAINS.
LOCHBOHRERKETTEN.
CHAINES À MORTAISER.
CADENAS PARA MORTAJAR.

a)
of three links
dreigliedrig
de trois maillons
de tres eslabones

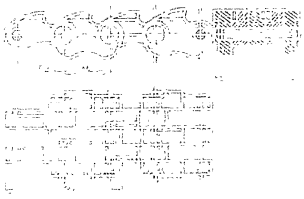


156 B/225790

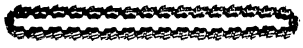


width of the chain inches	1/4"	9/32"	5/16"	11/32"	3/8"	7/16"	15/32"	1/2"	9/16"	14/32"	5/8"	21/32"
Breite / largeur / anchura mm	6	7	8	9	10	11	12	12	14	15	16	17

b)
of five links
fünfgliedrig
de cinque maillons
de cinco eslabones



156 B/225790



width of the chain inches	11/16"	3/4"	13/16"	27/32"	7/8"	29/32"	15/16"	1 3/16"	1 1/4"	1"	1 1/32"	
Breite / largeur / anchura mm	18	19	20	21	22	23	24	25	26	30	32	

If in the order the length of the mortise chain is not mentioned, they will be delivered in length of 34 double links.
Wenn in dem Auftrag die Länge der Lochbohrerkette nicht angeführt ist, wird dieselbe in der Länge von 34 Doppelgliedern geliefert.
Si dans la commande la longueur de la chaine à mortaiser n'est pas mentionnée, elle sera livrée dans longueur de 34 maillons doubles.
Si en el pedido la largura de la cadena no está mencionada, la misma estará entregada en largura de 34 eslabones dobles.

Packing: in boxes / Verpackung: in Schachteln / Emballage: dans boîtes / Embalaje: en cartónes

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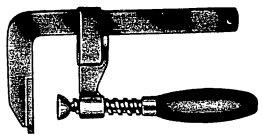
160 B/738



STEEL CLAMPS FOR JOINERS of high quality material, smooth surface. The joiners facility when glewing or hand-working wooden or other boards.

SCHRAUBZWINGEN FÜR TISCHLER aus Qualitäts-material, glatte Oberfläche. Tischlers Hilfsmittel bei Leimen oder Handbearbeiten der Holz- oder anderen Platten.

SERRE-JOINTS POUR MENUISIERS en matériel de qualité, surface lisse. Instrument de menuisier pour collage ou travail à main avec les plaques en bois et autres.

CÁRCELES PARA CARPINTEROS en material de calidad, superficie lisa. Instrumento para carpinteros en pegando o trabajando de mano con chapas de madera o otras.

working length Arbeitslänge longueur de travail largura de trabajo	inches	*6″*	*8″*	*10″*	*12″*	*14″*	*16″*	*20″*	*24″*	*28″*	*32″*	*36″*	*40″*	*50″*	*60″*	*70″*	*80″*	*100″*
	mm	150	200	250	300	350	400	500	600	700	800	900	1000	1250	1500	1750	2000	2500
wholo length ganzo Länge longueur complète largura entera	inches	*10 1/8″*	*12 5/16″*	*14 3/4″*	*16 11/16″*	*17 5/8″*	*21 5/16″*	*25 5/8″*	*29 5/8″*	*33 5/8″*	*37 3/4″*	*41 3/4″*	*45 3/8″*	*4 1/2′*	*5 3/8′*	*6 1/4′*	*7′ 7 5/8′*	
	mm	255	308	354	417	440	533	640	740	840	941	1045	1140	1395	1645	1895	2145	2945
width of arm Armbreite largeur de bras anchura de brazo	inches	*3 1/2″*	*4 1/2″*	*5 1/8″*	*5 1/2″*	*5 1/4″*	*6″*	*8″*	*8″*	*8″*	*8″*	*8″*	*8″*	*8″*	*8″*	*8″*	*8″*	*8″*
	mm	90	110	130	140	144	150	200	200	200	200	200	200	200	200	200	200	200
weight Gewicht poids / peso	lbs	*2 14/3/4*	*3/3*	*3/9*	*4 6/1/4*	*5 5/3/4*	*5/13*	*8/2*	*8/9*	*9 1/2*	*9 7/1/2*	*10/5*	*13 14/1/2*	*15 6/3/4*	*17 6/1/2*	*18 14/1/2*	*19 7/2/3*	*20 4/1/4*
	kgs	1,32	1,45	1,61	1,99	2,43	2,63	3,69	3,89	4,10	4,29	4,63	4,97	6,31	7,00	7,90	8,33	9,20

161 B/734

IRON CRAMP FOR DOOR, english pattern, of I iron.

EISERNE TÜRSPANNER, englisches Modell, aus I-Eisen.

ÉTAU EN FER POUR PORTES, façon anglaise, en fer, profil I.

CÁRCEL PARA PUERTAS inglés en hierro, perfil I.

ø I iron I-Eisen / fer do profil I hierro do perfil I	inches	*3 1/8″*	*3 1/8″*	*3 1/8″*	*3 1/8″*	*3 1/8″*	*3 1/8″*
	mm	80	80	80	80	80	80
working length Arbeitslänge / longueur de travail / largura do trabajo	feet	*3 1/4′*	*4′*	*5′*	*6′*	*6 1/2′*	*7 1/4′*
	mm	1000	1200	1500	1800	2000	2200
weight Gewicht / poids / peso	lbs	*22/9 1/2*	*25/12 1/2*	*24/3*	*33/3/4*	*36/2*	*34/7*
	kgs	10,85	11,80	13,25	15	16,40	17,90

IRON SPINDLE FOR FRONT CHOPS.

EISERNE VORDERSPINDEL.

VIS EN FER, POUR PRESSE DE DEVANT.

HUSILLO DE HIERRO PARA TORNILLO DELANTERO DEL BANCO.

162 B/742 A

ø of spindle (thickness) von Spindel (Dicke) / de vis (épaisseur) / do husillo / (grueso)	inches	*1 1/8″*	
	mm	28	
weight Gewicht / poids / peso	lbs	*5/12*	
	kgs	2,70	

IRON SPINDLE FOR END CHOP.

EISERNE HINTERSPINDEL.

VIS EN FER, POUR PRESSE DE DERRIÈRE.

HUSILLO DE HIERRO PARA TORNILLO TRASERO DEL BANCO.

163 B/742 B

ø of spindle (thickness) von Spindel (Dicke) / de vis (épaisseur) / do husillo / (grueso)	inches	*1 1/8″*	
	mm	28	
weight Gewicht / poids / peso	lbs	*7/13*	
	kgs	3,65	

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CIRCULAR SAW BLADES FOR WOOD • HOLZKREISSÄGEBLÄTTER • LAMES DES SCIES CIRCULAIRES À BOIS • HOJAS DE SIERRAS CIRCULARES PARA MADERA

TOOTH PATTERNS:
ZAHNUNGSMUSTER:
MODÈLES DES DENTS:
MODELOS DE DENTES:

a) cut with
Zahnung für
denture for
dientes para

b) teeth
Zahnung
denture
dentes

c) triangular symmetrical tooth cutting
symmetrische Dreieckzahnung
dentures triangulaires symétriques
dientes triangulares simétricos

d) combination tooth cutting for cross cut
Querzahnung
denture pour coup transversal
dientes para corte de través

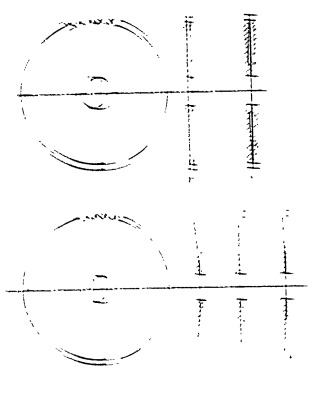
e) combination tooth cutting for oblong cut
Längszahnung
denture pour coup longitudinal
dientes para corte longitudinal

f) right hand concave saw blade
rechtskonkaves Sägeblatt
lame de scie concave à droite
hoja de sierra cóncava á la derecha

g) left hand concave saw blade
linkskonkaves Sägeblatt
lame de scie concave à gauche
hoja de sierra cóncava á la izquierda

h) concave saw blade with V toothing
konkaves Sägeblatt mit V-Zahnung
lame de scie concave avec denture V
hoja de sierra cóncava con dientes V

SECTIONS OF SAW BLADES
SÄGEBLATTQUERSCHNITTE
SECTIONS DES LAMES DE SCIES
SECCIONES DE HOJAS PARA SIERRAS



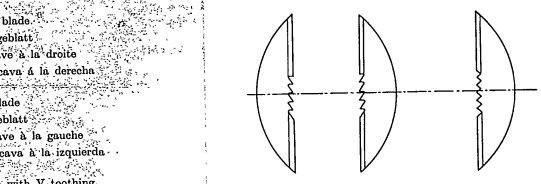
a) straight saw blade
gerades Sägeblatt
lame de scie droite
hoja de sierra recta

b) tapered saw blade
Sägeblatt, untergeschliffen
lame de scie décalaminée
hoja de sierra descarnada

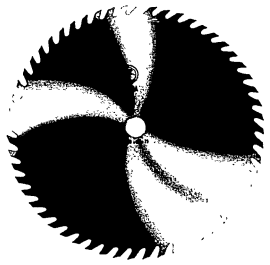
c) right hand concave saw blade
rechtskonkaves Sägeblatt
lame de scie concave à la droite
hoja de sierra cóncava á la derecha

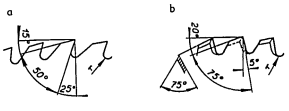
d) left hand concave saw blade
linkskonkaves Sägeblatt
lame de scie concave à la gauche
hoja de sierra cóncava á la izquierda

e) saw blade concave on both sides
beidseitig konkaves Sägeblatt
lame de scie concave des deux côtés
hoja de sierra cóncava de ambos lados



175 B/702





CIRCULAR SAW BLADES WITH A TEETH of carbonic tool steel, number of teeth 56.

KREISSÄGEBLÄTTER MIT WOLFZAHNUNG aus Werkzeugkohlenstahl, Anzahl der Zähne 56.

LAMES DE SCIES CIRCULAIRES AVEC DENTURE A d'acier carbonique, pour outils, nombre de dents 56.

HOJAS DE SIERRAS CIRCULARES CON DIENTES A de acero carbónico para herramientas. Número de dientes 56.

Execution / Ausführung / exécution / ejecución:

a) with teeth for oblong cut
mit Zahnung für Längsschnitt
avec denture pour coup longitudinal
con dientes para corte longitudinal

b) with teeth for cross cut
mit Zahnung für Querschnitt
avec denture pour coup transversal
con dientes para corte de través

ø	inches	8"	10"	12"	14"	16"	18"	20"	22"	24"	28"	32"	36"	40"	44"
	mm	200	250	300	350	400	450	500	550	600	700	800	900	1000	1100
thickness	inches	1/16"	1/16"	1/16"	1/16"	1/16"	3/32"	3/32"	3/32"	1/8"	1/8"	1/8"	5/32"	5/32"	5/32"
Dicke / épaisseur / grueso	mm	1,2	1,4	1,6	1,8	2	2,2	2,4	2,4	2,8	3,2	3,5	4,00	4,5	4,5
boring	inches	1"	1"	1 3/16"	1 3/16"	1 3/16"	1 3/16"	1 3/16"	1 3/16"	1 3/16"	1 3/8"	15/8"	2"	2"	2"
Bohrung / alésage / agujero	mm	25	25	30	30	30	30	30	30	30	35	40	50	50	50
weight	oz	9 1/4	17	30	45 2/3	67 1/2	92	120 1/3	148	204	340	504	664	1010	1464
Gewicht / poids / peso	kgs	0,24	0,48	0,84	1,28	1,89	2,57	3,37	4,14	5,71	9,51	14,10	18,60	28,27	40,72

Packing: The saw blades conserved against rust are put together in bundles, all interlaced with paper. The bundles of saws of the same size, type and toothing are packed in grooved paper and up to the diameter 14" are put in cases of greatest weight 160 lbs. From ø 14" they are put in crates.

Verpackung: Die gegen Rost konservierten Sägeblätter werden in Bündel zusammengelegt und mit Papier durchgelegt. Einzelne Bündel derselben Größe, Gattung und Zähne werden mit Wellpappe umgepackt und bis zum ø 360 mm in Kisten bei größtem Gewicht 80 kg gelegt. Von ø 360 mm werden sie in Verschlag gelegt.

Emballage: Les lames de scies conservées contre rouille sont liées en faisceaux et divisées par papier. Les faisceaux de la même taille, genre et denture sont enveloppés par carton ondulé et jusqu'à ø 360 mm mis en caisses de poids maximum 80 kg. De ø 360 mm ils sont mis en cages.

Embalaje: Las hojas de sierras conservadas contra herrumbre están ligadas en atados o interpuestos por papel. Los atados de sierras del mismo tamaño, especie y dientes están embalados en cartón ondulado y hasta ø 360 mm puestos en las cajas con peso máximo de 80 kg. De ø 360 mm están puestos en hucal.

PILANA made in switzerland

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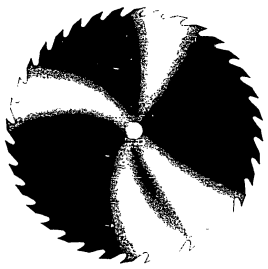
176 B/702



TRIMMING CIRCULAR SAW BLADES with A teeth, for oblong cut. Number of teeth 36.

BESÄUMKREISSÄGEBLÄTTER mit Wolfzahnung, für Längsschnitt. Zähneanzahl 36.

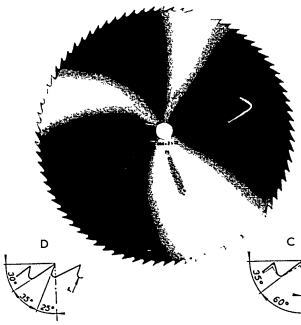
LAMES DE SCIES CIRCULAIRES À DRESSER avec denture A, pour coup longitudinal. Nombre de dents 36.

HOJAS DE SIERRAS CIRCULARES PARA RECORTAR. Para corte longitudinal, con dientes A. Número de dientes 36.

ø	inches	16″	18″	20″	24″
	mm	400	450	500	600
thickness	inches	3/32″	3/32″	1/8″	1/8″
Dicke / épaisseur / grueso	mm	2,4	2,8	3	3,5
boring	inches	1 3/16″	1 3/16″	1 3/16″	1 3/16″
Bohrung / alésage / agujero	mm	30	30	30	30
weight	oz	78 1/2	112	155	266
Gewicht / poids / peso	kgs	2,20	3,13	4,35	7,44

Packing: the same as 175 B/702 / Verpackung: dieselbe wie 175 B/702 / Emballage: le même que 175 B/702 / Embalaje: el mismo que 175 B/702

177 B/702



TRIMMING CIRCULAR SAW BLADES. Number of teeth 80.

BESÄUMKREISSÄGEBLÄTTER. Zähneanzahl 80.

LAMES DE SCIES CIRCULAIRES À DRESSER. Nombre de dents 80.

HOJAS DE SIERRAS CIRCULARES PARA RECORTAR. Número de dientes 80.

Execution / Ausführung / exécution / ejecución:

Is to be mentioned in the order
In der Bestellung anzugeben
Doit être mentionnée dans la commande
Debe ser mencionada en el pedido

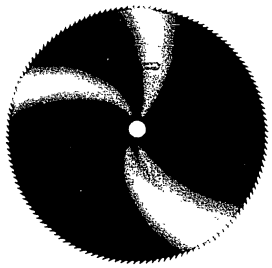
a) with teeth for oblong cut D
mit Zahnung für Längsschnitt D
avec denture pour coup longitudinal D
con dientes para corte longitudinal D

b) with teeth for cross cut C
mit Zahnung für Querschnitt C
avec denture pour coup transversal C
con dientes para corte de través C

ø	inches	8″	10″	12″	14″	16″	18″
	mm	200	250	300	350	400	450
thickness:	inches	1/16″	1/16″	1/16″	3/32″	3/32″	3/32″
Dicke / épaisseur / grueso	mm	1,2	1,4	1,6	1,8	2,—	2,2
boring	inches	1″	1″	1 3/16″	1 3/16″	1 3/16″	1 3/16″
Bohrung / alésage / agujero	mm	25	25	30	30	30	30
weight	oz	9 1/3	17	30	46	68	92
Gewicht / poids / peso	kgs	0,26	0,48	0,83	1,38	1,89	2,57

Packing: the same as 175 B/702 / Verpackung: dieselbe wie 175 B/702 / Emballage: le même que 175 B/702 / Embalaje: el mismo que 175 B/702

178 B/702



TRIMMING CIRCULAR SAW BLADES with triangular fine teeth.

BESÄUMKREISSÄGEBLÄTTER mit feiner Dreieckzahnung.

LAMES DE SCIES CIRCULAIRES À DRESSER avec denture triangulaire fine.

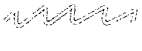
HOJAS DE SIERRAS CIRCULARES PARA RECORTAR con dientes triangulares sutiles.

The blades of ø 8″ to ø 10″, thickness 3/32″, can be used for bone cutting.

Die Blätter von ø 200 bis ø 400, Breite 1,8 mm, können für Knochenschneiden benützt werden.

Les lames de ø 200 au ø 400 mm, épaisseur 1,8 mm, peuvent être utilisées pour couper les os.

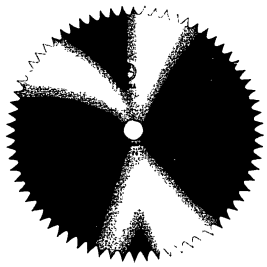
Las hojas de ø 200 mm a ø 400 mm, grueso 1,8 mm, pueden ser utilisadas para cortar los huesos.



ø	inches	1 3/4″	3 1/8″	4″	4 3/4″	6 1/4″	8″	10″	12″	14″	16″
	mm	50	80	100	120	160	200	250	300	350	400
thickness	inches	1/32″	1/32″	1/32″	1/16″	1/16″	3/32″		3/32″		
Dicke / épaisseur / grueso	mm	0,6	0,8	0,8	0,9	1	1,8	1,8	1,8	1,8	1,8
boring	inches	3/8″	3/8″	3/8″	5/8″	5/8″	1″	1″	1 3/16″	1 3/16″	1 3/16″
Bohrung / alésage / agujero	mm	10	10	10	16	16	25	25	30	30	30
weight	oz	2/3	1 1/2	2	3	5 3/4	15	24	35	46	64
Gewicht / poids / peso	kgs	0,02	0,04	0,054	0,085	0,161	0,42	0,66	0,97	1,30	1,80

Packing: the same as 121 B/702 / Verpackung: dieselbe wie 121 B/702 / Emballage: le même que 121 B/702 / Embalaje: el mismo que 121 B/702

179 B/702



TRIMMING CIRCULAR SAW BLADES for pendulum saws.

BESÄUMKREISSÄGEBLÄTTER für Pendelsägen.

LAMES DE SCIES CIRCULAIRES À DRESSER pour scies de pendule.

HOJAS DE SIERRAS CIRCULARES PARA RECORTAR para sierras de péndulo.

ø	inches	12″	14″	16″	18″
	mm	300	350	400	450
thickness	inches	3/32″	3/32″	1/8″	1/8″
Dicke / épaisseur / grueso	mm	2	2,2	2,4	2,8
boring	inches	1 3/16″	1 3/16″	1 3/16″	1 3/16″
Bohrung / alésage / agujero	mm	30	30	30	30
weight	oz	37	50	78	114
Gewicht / poids / peso	kgs	1,04	1,58	2,19	3,19

Packing: the same as 121 B/702 / Verpackung: dieselbe wie 121 B/702 / Emballage: le même que 121 B/702 / Embalaje: el mismo que 121 B/702

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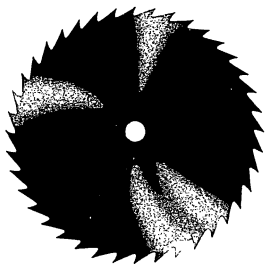
180 B/702



TRIMMING CIRCULAR SAW BLADES with triangular teeth for oblong cut. Number of teeth 40.

BESÄUMKREISSÄGEBLÄTTER mit Dreieckzahnung für Längsschnitt. Zähneanzahl 40.

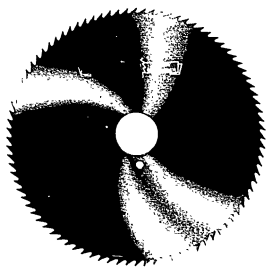
LAMES DE SCIES CIRCULAIRES À DRESSER avec denture triangulaire pour le coup longitudinal. Nombre de dents 40.

HOJAS DE SIERRAS CIRCULARES PARA RECORTAR con dientes triangulares para el corte longitudinal. Número de dientes 40.

ø	inches	12″	14″	16″	18″	
	mm	300	350	400	450	
thickness	inches	3/32″	3/32″	1/8″	1/8″	
Dicke / épaisseur / grueso	mm	2	2,2	2,4	2,8	
boring	inches	1 3/16″	1 3/16″	1 3/16″	1 3/16″	
Bohrung / alésage / agujero	mm	30	30	30	30	
weight	oz	37	58 1/2	78	114	
Gewicht / poids / peso	kgs	1,04	1,68	2,19	3,19	

Packing: the same as 121 B/702 / Verpackung: dieselbe wie 121 B/702 / Emballage: le même que 121 B/702 / Embalaje: el mismo que 121 B/702

181 B/779



TRIMMING CIRCULAR SAW BLADES for swiveling cases.

BESÄUMKREISSÄGEBLÄTTER für Wankkapsel.

LAMES DE SCIES CIRCULAIRES pour étuis oscillantes.

HOJAS DE SIERRAS CIRCULARES para cajas vacilantes.

Execution / Ausführung / Exécution / ejecución:
a) with teeth for oblong cut
mit Zahnung für Längsschnitt
avec denture pour coup longitudinal
con dientes para corte longitudinal
b) with teeth for cross cut
mit Zahnung für Querschnitt
avec denture pour coup transversal
con dientes para corte de través

ø	inches	8″	10″	12″	14″	16″	18″
	mm	200	250	300	350	400	450
thickness	inches	3/32″	3/32″	1/8″	1/8″	1/8″	1/8″
Dicke / épaisseur / grueso	mm	2	2,2	2,4	2,8	3	3,2
boring	inches	2″	2″	2″	2″	2″	2″
Bohrung / alésage / agujero	mm	50	50	50	50	50	50
weight	oz	16	28	45 2/3	67	96 1/2	130 1/3
Gewicht / poids / peso	kgs	0,45	0,78	1,28	1,88	2,70	3,65

Packing: The same as 121 B/702 / Verpackung: dieselbe wie 121 B/702 / Emballage: le même que 121 B/702 / Embalaje: el mismo que 121 B/702

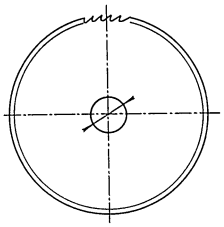
TENON CIRCULAR SAW BLADES. Number of teeth 90.

ZAPFENKREISSÄGEBLÄTTER. Zähneanzahl 90.

LAMES DE SCIES CIRCULAIRES À TENONER. Nombre de dents 90.

HOJAS DE SIERRAS CIRCULARES PARA ESPIGAR. Número de dientes 90.

182 B/702



ø	inches	8″	10″	12″	14″	16″	18″
	mm	200	250	300	350	400	450
thickness	inches	3/32″	3/32″	3/32″	1/8″	1/8″	1/8″
Dicke / épaisseur / grueso	mm	2	2,2	2,4	2,8	3	3,2
boring	inches	1 3/16″	1 3/16″	1 3/16″	1 3/16″	1 3/16″	1 3/16″
Bohrung / alésage / agujero	mm	30	30	30	30	30	30
weight	oz	18	20 2/3	48	69	98	132 1/2
Gewicht / poids / peso	kgs	0,5	0,83	1,35	1,93	2,75	3,71

Packing: the same as 121 B/702 / Verpackung: dieselbe wie 121 B/702 / Emballage: lo même que 121 B/702 / Embalaje: el mismo que 121 B/702

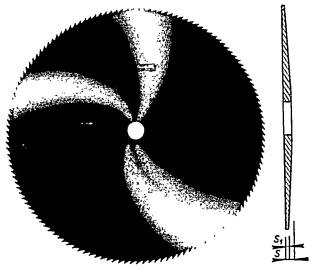
TENON CIRCULAR SAW BLADES right conic with D or A-teeth. Number of teeth 140.

ZAPFENKREISSÄGEBLÄTTER, rechtskonisch mit D- oder A-Zahnung. Zähneanzahl 140.

LAMES DE SCIES CIRCULAIRES À TENONER coniques à droit, denture D ou A. Nombre de dents 140.

HOJAS DE SIERRAS CIRCULARES PARA ESPIGAR cónicas á la derecha, dientes D o A. Número de dientes 140.

183 B/696



ø	inches	14″	16″	18″	20″	24″	28″
	mm	350	400	450	500	600	700
thickness	inches a)	3/32″	3/32″	3/32″	1/8″	1/8″	1/8″
Dicke / épaisseur / grueso	mm	2,2	2,4	2,8	3	3,5	3,6
	inches b)	1/16″	1/16″	1/16″	1/16″	1/16″	1/16″
	mm	1	1,2	1,2	1,2	1,4	1,6
boring	inches	1 3/16″	1 3/16″	1 3/16″	1 3/8″	1 3/8″	1 3/8″
Bohrung / alésage / agujero	mm	30	30	30	35	35	35
weight	oz	32	51 1/2	85 2/3	114	143	233
Gewicht / poids / peso	kgs	0,98	1,44	2,40	3,19	4,01	6,63

Packing: the same as 121 B/702 / Verpackung: dieselbe wie 121 B/702 / Emballage: lo même que 121 B/702 / Embalaje: el mismo que 121 B/702

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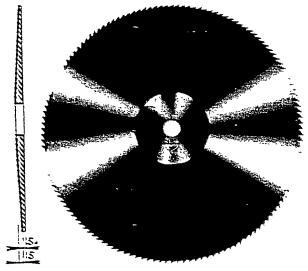
184 B/696



TENON CIRCULAR SAW BLADES, left conic.

ZAPFENKREISSÄGEBLÄTTER, linkskonisch.

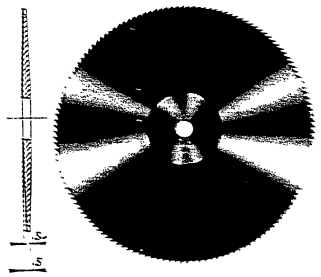
LAMES DE SCIES CIRCULAIRES À TENONER ...iques à gauche.

HOJAS DE SIERRAS CIRCULARES PARA E...GAR cónicas á la izquierda.

ø	inches	14"	16"	18"	20"	24"	28"
	mm	350	400	450	500	600	700
thickness a)	inches	3/32"	3/32"	3/32"	1/8"	1/8"	1/8"
Dicke / épaisseur / grueso	mm	2.2	2,4	2.8	3	3,5	3,5
b)	inches	1/16"	1/16"	1/16"	1/16"	1/16"	1/16"
	mm	1	1.2	1.2	1.2	1,4	1,6
boring	inches	1 3/16"	1 3/16"	1 3/16"	1 3/8"	1 3/8"	1 3/8"
Bohrung / alésage / agujero	mm	30	30	30	35	35	35
weight	oz	32	37 1/2	85 2/3	114	143	233
Gewicht / poids / peso	kgs	0,89	1,44	2,40	3,19	4,01	6,53

Packing: the same as 121 B/702 / Verpackung: dieselbe wie 121 B/702 / Emballage: le même que 121 B/702 / Embalaje: el mismo que 121 B/702

185 B/696



TENON CIRCULAR SAW BLADES CONIC ON BOTH SIDES.

ZAPFENKREISSÄGEBLÄTTER, BEIDERSEITS KONISCH.

LAMES DE SCIES CIRCULAIRES À TENONER CONIQUES DE DEUX CÔTÉS.

HOJAS DE SIERRAS CIRCULARES PARA ESTIGAR CÓNICAS DE AMBOS LADOS.

ø	inches	14"	16"	18"	20"	24"	28"
	mm	350	400	450	500	600	700
thickness a)	inches	3/32"	3/32"	3/32"	1/8"	1/8"	1/8"
Dicke / épaisseur / grueso	mm	2.2	2,4	2.8	3	3,5	3,5
b)	inches	1/16"	1/16"	1/16"	1/16"	1/16"	1/16"
	mm	1	1.2	1.2	1.2	1,4	1,6
boring	inches	1 3/16"	1 3/16"	1 3/16"	1 3/8"	1 3/8"	1 3/8"
Bohrung / alésage / agujero	mm	30	30	30	35	35	35
weight	oz	32	37 1/2	85 2/3	114	143	233
Gewicht / poids / peso	kgs	0,89	1,44	2,40	3,19	4,01	6,53

Packing: the same as 121 B/702 / Verpackung: dieselbe wie 121 B/702 / Emballage: le même que 121 B/702 / Embalaje: el mismo que 121 B/702

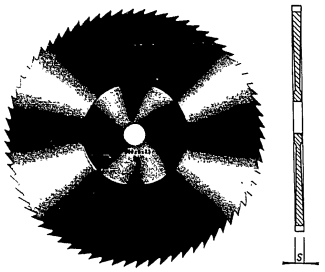
GROOVING CIRCULAR SAW BLADE BACKED OFF. Number of teeth 70.

NUTKREISSÄGEBLATT, UNTERGESCHLIFFEN. Zähneanzahl 70.

LAME DE SCIES CIRCULAIRES À RAINURES DÉTALONÉE. Nombre de dents 70.

HOJA DE SIERRAS CIRCULARES PARA RANURAS DESPEJADA. Número de dientes 70.

186 B/707



ø	inches	3 1/8"	4"	4 3/4"	6 1/4"	8"			
	mm	80	100	120	160	200			
thickness inches		3/32"	1/8"	5/32"	3/16"	1/4"	1/8"	5/32"	3/16" 1/4"
Dicke/épaisseur grueso	mm	2	3	4	5	6	3	4	5 6
boring	inches	5/8"	5/8"	5/8"	5/8"	1"			
Bohrung alésage agujero	mm	16	16	16	16	25			
weight	oz	3-4-5-7-8	4-7-8-11-13	5-7-10-13-16	9-13-18-23-26	21-27-33-42			
Gewicht poids/peso	kgs	0,08-0,12-0,15	0,12-0,18-0,24	0,14-0,21-0,28	0,26-0,38-0,52	0,60-0,79-0,98-1,18			
		0,19-0,23	0,3-0,36	0,35-0,42	0,65-0,78				

ø	inches	10"	12"	14"					
	mm	250	300	350					
thickness	inches			1/8"	5/32"	3/16"	1/4"		
Dicke / épaisseur / grueso	mm			3	4	5	6		
boring	inches	1"	1 3/16"	1 3/16"					
Bohrung / alésage agujero	mm	25	30	30					
weight	oz	26-37-47-55	47-60-75-92	63-85-107-130					
Gewicht / poids / peso	kgs	0,75 1,02 1,30 1,55	1,30 1,70 2,12 2,58	1,80 2,40 2,99 3,60					

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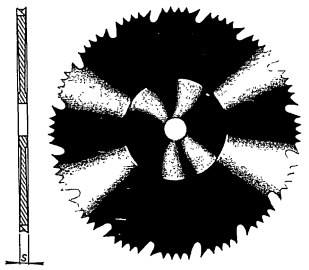
187 B/705

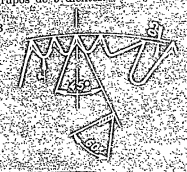


GROOVING CIRCULAR SAW BLADE WITH COMBINATION TOOTHING for cross cut. Number of teeth: 16 groups of 5 teeth.

NUTKREISSÄGEBLÄTTER MIT GRUPPENZAHNUNG für Querschnitt. Zahneanzahl: 16 Gruppen von 5 Zähnen.

LAME DE SCIES CIRCULAIRES À RAINURES AVEC DENTURE GROUPÉE pour coup transversal. Nombre de dents: 16 groupes à 5 dents.

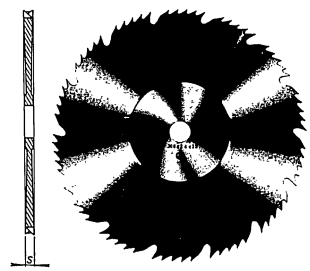
HOJA DE SIERRAS CIRCULARES PARA RANURAS CON DIENTES EN GRUPOS, para corte de través. Número de dientes: 16 grupos de 5 dientes.



ø inches	8″	10″	12″	14″	16″	18″
ø mm	200	250	300	350	400	450
thickness inches	3/32″	3/32″	3/32″	1/8″	1/8″	1/8″
Dicke / épaisseur / grueso mm	2	2,2	2,4	2,8	3	3,2
boring inches	1″	1″	1 3/16″	1 3/16″	1 3/16″	1 3/16″
Bohrung / alésage / agujero mm	25	25	30	30	30	30
weight oz	13	22	35	55	76	104
Gewicht / poids / peso kgs	0,36	0,62	0,98	1,55	2,16	2,89

Packing: the same as 121 B/702 / Verpackung: dieselbe wie 121 B/702 / Emballage: le même que 121 B/702 / Embalaje: el mismo que 121 B/702

188 B/705



GROOVING CIRCULAR SAW BLADE WITH COMBINATION TOOTHING for oblong cut. Number of teeth: 14 groups of 5 teeth.

NUTKREISSÄGEBLÄTTER MIT GRUPPENZAHNUNG für Längsschnitt. Zähneanzahl: 14 Gruppen von 5 Zähnen.

LAME DE SCIES CIRCULAIRES À RAINURES AVEC DENTURE GROUPÉE pour coup longitudinal. Nombre de dents: 14 groupes à 5 dents.

HOJA DE SIERRAS CIRCULARES PARA RANURAS CON DIENTES EN GRUPOS, para corte longitudinal. Número de dientes: 14 grupos de 5 dientes.

ø inches	8″	10″	12″	14″	16″	18″
ø mm	200	250	300	350	400	450
thickness inches	3/32″	3/32″	3/32″	1/8″	1/8″	1/8″
Dicke / épaisseur / grueso mm	2	2,2	2,4	2,8	3	3,2
boring inches	1″	1″	1 3/16″	1 3/16″	1 3/16″	1 3/16″
Bohrung / alésage / agujero mm	25	25	30	30	30	30
weight oz	13	22	35	55	76	104
Gewicht / poids / peso kgs	0,36	0,62	0,98	1,55	2,16	2,89

Packing: the same as 121 B/702 / Verpackung: dieselbe wie 121 B/702 / Emballage: le même que 121 B/702 / Embalaje: el mismo que 121 B/702

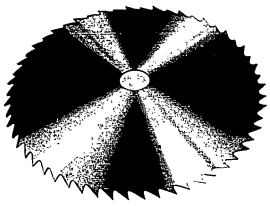
GROOVING CIRCULAR SAW BLADE RIGHT CONCAVE. The diameter, thickness and boring are to be mentioned in the order.

NUTKREISSÄGEBLÄTTER RECHTS KONKAV. Der Durchmesser, die Dicke und Bohrung müssen in der Bestellung vorgeschrieben werden.

LAME DE SCIES CIRCULAIRES À RAINURES CONCAVE À DROIT. Le diamètre, épaisseur et alésage doivent être prescrits dans la commande.

HOJA DE SIERRAS CIRCULARES PARA RANURAS CÓNCAVA A LA DERECHA. El diámetro, grueso y agujero deben ser mencionados en el pedido.

189 B/225350



ø inches	5″	5 1/8″	3″	6 1/4″	7 1/8″	7 3/4″	8″	
mm	125	130	150	160	180	195	200	
ø inches	8 1/4″	9 1/2″	10″	10 3/16″	10 5/16″	12″	13″	
mm	210	240	250	262	269	300	325	
ø inches	14″	14 1/4″	15 1/8″	16″	18″	18 1/4″	19 1/2″	
mm	350	360	380	400	450	460	490	
ø inches	20″	22″	26″	28″	32″			
mm	500	550	650	700	800			

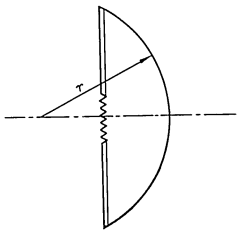
GROOVING CIRCULAR SAW BLADE LEFT CONCAVE. The diameter, thickness and boring are to be mentioned in the order.

NUTKREISSÄGEBLÄTTER LINKS KONKAV. Der Durchmesser, die Dicke und Bohrung müssen in der Bestellung vorgeschrieben werden.

LAME DE SCIES CIRCULAIRES À RAINURES CONCAVE À GAUCHE. Le diamètre, épaisseur et alésage doivent être prescrits dans la commande.

HOJA DE SIERRAS CIRCULARES PARA RANURAS CÓNCAVA A LA IZQUIERDA. El diámetro, grueso y agujero deben ser mencionados en el pedido.

190 B/225331



ø inches	5″	5 1/8″	3″	6 1/4″	7 1/8″	7 3/4″	8″	
mm	125	130	150	160	180	195	200	
ø inches	8 1/4″	9 1/2″	10″	10 3/16″	10 5/16″	12″	13″	
mm	210	240	250	262	269	300	325	
ø inches	14″	14 1/4″	15 1/8″	16″	18″	18 1/4″	19 1/2″	
mm	350	360	380	400	450	460	490	
ø inches	20″	22″	26″	28″	32″			
mm	500	550	650	700	800			

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191 B/2698

AXLE-TREE FOR CIRCULAR SAWS of construction steel, settled down in ball-bearings. The body of the axle-tree of grey cast-iron. The axle-tree provided on one side by flat belt-pulley, on the other by flanges for fastening circular saw blades.

KREISSÄGEWELLE aus Konstruktionsstahl, in Kugellagern gelegt. Der Körper der Kreissägewelle aus Grauguß. Die Kreissägewelle auf einer Seite mit flacher Riemenscheibe versehen, auf der anderen mit Flanschen zur Befestigung des Kreissägeblattes.

ARBRE DES SCIES CIRCULAIRES, d'acier de construction, reposé en couches de billes. Le corps d'arbre en fonte grise. L'arbre est muni d'un côté d'une poulie de courroie plate, d'autre des bourrelets pour fixation de la lame de scie circulaire.

ARBOL PARA SIERRAS CIRCULARES de acero de construcción, colocado en juego de bolas. El cuerpo de arbol en hierro colado gris. Arbol provisto en un lado de polea de transmisión chata, en el otro de enchufes para fijar las hojas de sierras circulares.

ø inches *1 3/16"*
mm 30

weight: lbs *31*
Gewicht / poids / peso kgs 14,10

Packing: per 1 piece free / Verpackung: à 1 Stück frei / Emballage: à 1 pièce librement / Embalaje: 1 pieza de manera libre

192 B/2702

AXLE-TREE FOR CIRCULAR SAWS WITH LONGER AXLE OF *4 3/4"*, without Drill Chuck. The body of axle of grey cast iron. Axle of construction steel, settled down in ball-bearings. On one side provided with flat belt-pulley, on the other with lengthened part and flanges; flanges provided with grooves for fastening the knives.

KREISSÄGEWELLE UM 12 mm VERLÄNGERT, ohne Bohrfutter. Der Körper der Welle aus Grauguß. Die Welle aus Konstruktionsstahl, in Kugellagern gelegt. Auf einer Seite versehen mit Flachriemenscheibe, auf der anderen mit Verlängerung und Flanschen. Die Flanschen mit Nuten zur Befestigung der Messer versehen.

ARBRE DES SCIES CIRCULAIRES ALLONGÉ DE 12 mm, sans mandrin. Le corps d'arbre de la fonte grise. L'arbre d'acier de construction reposé en couches de billes. D'un côté muni par poulie plate, d'autre d'allongement et bourrelets. Les bourrelets munies des rainures pour fixer les couteaux.

ARBOL PARA SIERRAS CIRCULARES ALARGADO DE 12 mm, sin mandrin. El cuerpo de arbol de hierro colado gris. Arbol de acero de construcción, colocado en juego de bolas. En un lado provisto con polea de transmisión chata, en el otro de parte alargada y enchufes. Los enchufes provistos de ranuras para afirmar los cuchillos.

ø inches *1 3/16"*
mm 30

weight lbs *36*
Gewicht / poids / peso kgs 16,30

Packing: per 1 piece in crates / Verpackung: à 1 Stück in Verschlag / Emballage: à 1 pièce en cages / Embalaje: á 1 pieza en huacal

AXLE-TREE FOR CIRCULAR SAWS WITH CHUCK DRILL. The body of axle of grey cast iron. Axle of construction steel, settled down in ball-bearings. The drive of axle-tree by flat belt-pulley; behind the pulley is the drill chuck with fastening extent 0—5/8". On the other side the axle-tree lengthened. The lengthened part has the flanges, provided with grooves for fastening the knives.

KREISSÄGEWELLE MIT BOHRFUTTER. Der Körper der Welle aus Grauguß. Die Welle aus Konstruktionsstahl, in Kugellagern gelegt. Der Antrieb der Welle durch flache Riemenscheibe. Hinter der Riemenscheibe befindet sich das Bohrfutter mit Aufspannumfang 0—16 mm. Auf der zweiten Seite ist die Welle verlängert. Die Verlängerung hat Flanschen, versehen mit Nuten zur Befestigung der Messer.

ARBRE DES SCIES CIRCULAIRES AVEC MANDRIN. Le corps d'arbre de la fonte grise. L'arbre d'acier de construction reposé en couches de billes. Traction d'arbre par poulie plate. Derrière la poulie se trouve le mandrin avec extension pour attacher 0—16 mm. L'autre côté d'arbre allongée. L'allonge a les bourrelets munies des rainures pour fixer les couteaux.

ARBOL PARA SIERRAS CIRCULARES CON MANDRIN. El cuerpo de arbol de hierro colado gris. Arbol de acero de construcción, colocado en juego de bolas. Impulso de arbol por polea de transmisión chata. Detrás de polea se halla el mandrin con extensión para fijar 0—16 mm. En otro lado el arbol alargado. La parte alargada tiene enchufes provistos de ranuras para afirmar los cuchillos.

193 B/2700

ø inches *1 3/16"*
mm 30 mm

weight lbs *3/14*
Gewicht / poids / peso kgs 17,50

Packing: per 1 piece free / Verpackung: à 1 Stück frei / Emballage: à 1 pièce librement / Embalaje: 1 pieza de manera libre

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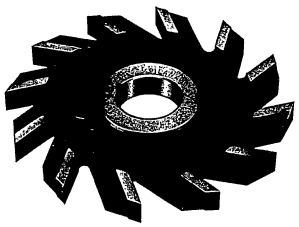
CUTTERS · FRÄSER · FRAISES · FRESAS

200 B/1810

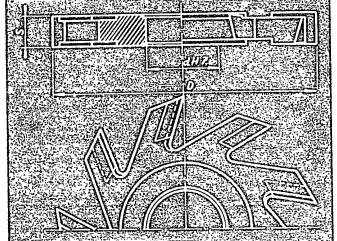


CUTTER FOR GROOVING with alternating slanting and straight edge. Material: cast tool steel.

NUTFRÄSER mit wechselbarer Schief- und Geradeschärfe. Material: Gußwerkzeugstahl.

FRAISES POUR RAINURES avec tranchant alternatif oblique et droit. Matériel: acier fonte pour outils.

FRESA PARA RANURAS con corte alternativo oblicuo y derecho. Material: acero colado para herramientas.



ø	inches	3 1/8"	4"	4 3/4"	5 1/2"	6 1/4"	7 1/8"	8"
	mm	80	100	120	140	160	180	200
width	inches	3/16" 1/4" 5/16"	3/16" 1/4" 5/16" 3/8" 5/32"	3/16" 1/4" 5/16" 3/8" 5/32"	5/16" 3/8" 15/32"	5/16" 3/8" 3/16" 15/32"	5/16" 3/8" 15/32"	5/16" 3/8" 15/32" 9/16"
Breite / largeur anchura	mm	5 6 8	5 6 8 10 12	5 6 8 10 12	8 10 12	8 10 12	8 10 12	8 10 12 14
boring	inches	1"	1 3/16" (1")	1 3/16" (1")	1 3/16" (1")	1 3/16" (1")	1 3/16" (1")	1 3/16" (1")
Bohrung / alésage agujero	mm	25	30 (25)	30 (25)	30 (25)	30 (25)	30 (25)	30 (25)
teeth/Zähne/dents dientes		6	9	9, 12	12	12	12	12

The sample of order: 10 pieces Cutter 161 B/1810 ø 4"×5/16"×1 3/16"—9"
Beispielauftrag: 10 Stück Fräser 161 B/1810 ø 100×8×30—9
Exemplo de la commande: 10 pièces fraises 161 B/1810 ø 100×8×30—9
Ejemplo del pedido: 10 piezas fresas 161 B/1810 ø 100×8×30—9

Packing: according order / Verpackung: laut Bestellung / Emballage: selon commande / Embalaje: según pedido

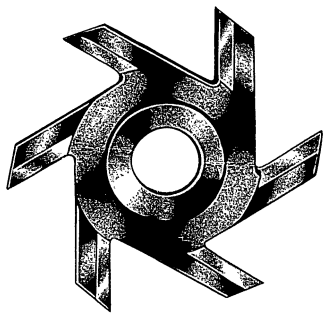
CUTTER FOR GROOVING with straight edge for cutting; material: cast tool steel.

NUTFRÄSER mit gerader Fräsenschärfe. Material: Gußwerkzeugstahl.

FRAISES POUR RAINURES avec tranchant droit pour fraiser. Matériel: acier fonte pour outils.

FRESA PARA RANURAS con corte derecho para fresar. Material: acero colado para herramientas.

201 B/1812



ø	inches	3 1/8"	4"	4 3/4"	5 1/2"	6 1/4"	7 1/8"	8"
	mm	80	100	120	140	160	180	200
width	inches	3/16" 1/4" 5/16"	3/16" 1/4" 5/16" 3/8" 5/32"	3/16" 1/4" 5/16" 3/8" 5/32"	5/16" 3/8" 15/32"	5/16" 3/8" 15/32"	5/16" 3/8" 15/32"	5/16" 3/8" 15/32" 9/16"
Breite / largeur anchura	mm	5 6 8	5 6 8 10 12	5 6 8 10 12	8 10 12	8 10 12	8 10 12	8 10 12 14
boring	inches	1"	1 3/16" (1")	1 3/16" (1")	1 3/16" (1")	1 3/16" (1")	1 3/16" (1")	1 3/16" (1")
Bohrung / alésage agujero	mm	25	30 (25)	30 (25)	30 (25)	30 (25)	30 (25)	30 (25)
teeth / Zähne dents / dientes		6	9	9, 12	12	12	12	12

The sample of order: 10 pieces Cutter 162 B/1810 ø 4"×5/16"×1 3/16"—9
Beispielauftrag: 10 Stück Fräser 162 B/1810 ø 100×8×30—9
Exemple de la commande: 10 pièces fraises 162 B/1810 ø 100×8×30—9
Ejemplo del pedido: 10 piezas fresas 162 B/1810 ø 100×8×30—9

Packing: according order / Verpackung: laut Bestellung / Emballage: selon commande / Embalaje: según pedido

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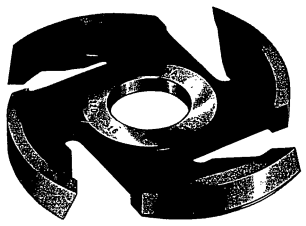
202 B/1804

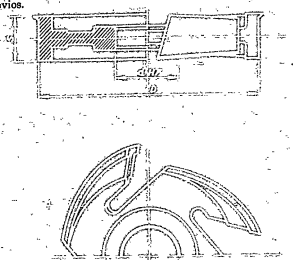


CUTTER FOR GROOVING with backed off edges and fore-cutters.

NUTFRÄSER mit hintergedrehter Schärfe und Vorschneidern.

FRAISES POUR RAINURES avec tranchant détalonné et coupe-avants.

FRESA PARA RANURAS con corte despejado y cortadores previos.

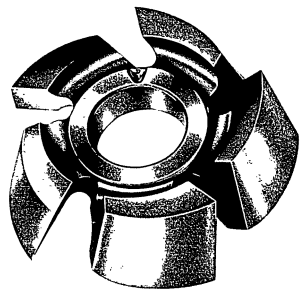


ø inches	4"								4 3/4"				
mm	100								120				
width inches	9/16"	5/8"	11/16"	13/16"	1"	1 3/16"	1"	1 3/16"	1 3/8"	1 5/8"	1 3/4"	2"	
	1 3/8"	1 5/8"	1 3/4"	2"									
Breite / largeur / anchura mm	14	16	18	20	25	30	25	30	35	40	45	50	
	35	40	45	50									
boring inches	1 3/16"	1"							1 3/16"	1"			
Bohrung / alésage / agujero mm	30 (25)								30 (25)				

ø inches	5 1/2"								6 1/4"				
mm	140								160				
width inches:	9/16"	5/8"	11/16"	13/16"	1"	13/16"	9/16"	5/8"	11/16"	13/16"	1"	13/16"	
	1 3/8"	1 3/8"	1 3/4"	2"			13/8"	1 5/8"	1 3/4"	2"			
Breite / largeur / anchura mm	14	16	18	20	25	30	14	16	18	20	25	30	
	35	40	45	50			35	40	45	50			
boring inches	1 3/16"		1"				1 3/16"		1"				
Bohrung / alésage / agujero mm	30		25				30		25				

Packing: according order / Verpackung: laut Bestellung / Emballage: selon commando / Embalaje: según pedido

203 B/1800

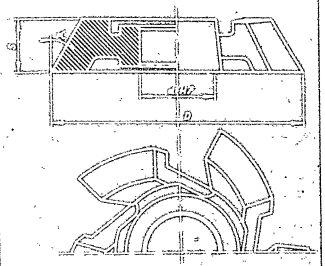


PROFILE WOODCUTTER, profile No 13 with backed-off edges.

PROFILFRÄSER, Profil Nr. 13, mit hintergedrehten Zähnen.

FRAISE DE PROFIL, profil No 13, avec tranchants détalonnés.

FRESA DE PERFIL; perfil No 13 con corte despejado.



angle / Winkel / ángulo	45°								60°				
ø inches	4	4 3/4	5 1/2	6 1/4					4	4 3/4			
mm	100	120	140	160					100	120			
width inches	15/32	19/32	13/16	1 3/16	1 3/8	1 5/8			3/8	21/32	13/16	1	1 1/8
Breite / largeur / anchura mm	12	15	20	30	35	40			10	15	20	25	30
boring inches	1 3/16" (1")								1 3/16" (1")				
Bohrung / alésage / agujero mm	30 (25)								30 (25)				

angle / Winkel / ángulo	75°						
ø inches	4						
mm	100						
width inches	3/8	21/32	13/16	1	1 1/8	1 3/8	1 5/8
Breite / largeur / anchura mm	10	15	20	25	30	35	40
boring inches	1 3/16" (1")						
Bohrung / alésage / agujero mm	30 (25)						

Packing: according order / Verpackung: laut Bestellung / Emballage: selon commando / Embalaje: según pedido

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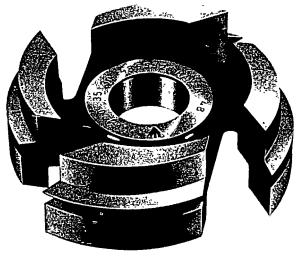
204 B/1802

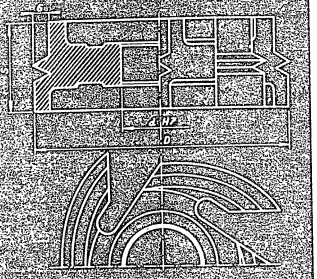


JOINTING WOODCUTTER, profile No 41 with backed-off edges.

VERLEIMFRÄSER, Profil Nr. 41, mit hintergedrehten Zähnen.

FRAISE DE JOINTS, profil No 41 avec tranchants détalonnés.

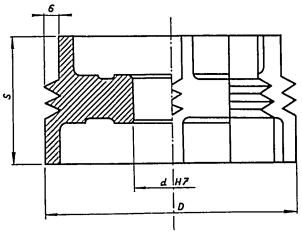
FRESA DE JONTURAS, perfil No 41 con corte despejado.



ø	inches	4"		4 3/4"	
	mm	100		120	
width	inches	1 3/8"		2"	
Breite / largeur / anchura	mm	35		50	
boring	inches	1 3/16"		1 3/16"	
Bohrung / alésage / agujero	mm	30		30	

Packing: according order / Verpackung: laut Bestellung / Emballage: selon commande / Embalaje: según pedido

205 B/1802



JOINTING WOODCUTTER, profile No 42 with backed-off edges.

VERLEIMFRÄSER, Profil Nr. 42, mit hintergedrehten Zähnen.

FRAISE DE JOINTS, profil No 42 avec tranchants détalonnés.

FRESA DE JONTURAS, perfil No 42 con corte despejado.

ø	inches	4"		4 3/4"	
	mm	100		120	
width	inches	2"		2"	
Breite / largeur / anchura	mm	50		50	
boring	inches	1 3/16"		1 3/16"	
Bohrung / alésage / agujero	mm	30		30	

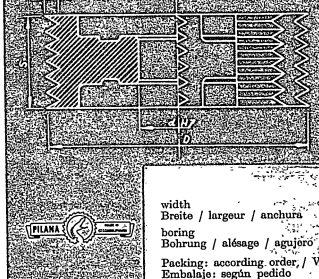
Packing: according order / Verpackung: laut Bestellung / Emballage: selon commande / Embalaje: según pedido

JOINTING WOODCUTTER, profile No 43 with backed-off edges.

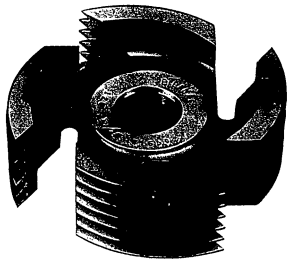
VERLEIMFRÄSER, Profil Nr. 43, mit hintergedrehten Zähnen.

FRAISE DE JOINTS, profil No 43 avec tranchants détalonnés.

FRESA DE JONTURAS, perfil No 43 con corte despejado.



206 B/1802



ø	inches	4"		4 3/4"	
	mm	100		120	
width	inches	1 3/8"	2"	1 3/8"	2"
Breite / largeur / anchura	mm	35	50	35	50
boring	inches	1 3/16"		1 3/16"	
Bohrung / alésage / agujero	mm	30		30	

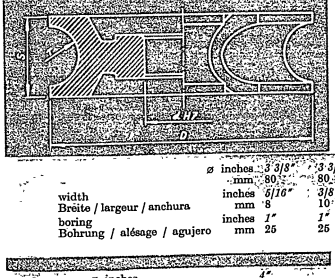
Packing: according order, / Verpackung: laut Bestellung / Emballage: selon commande / Embalaje: según pedido

PROFILE WOODCUTTER, profile No 10 with backed-off edges.

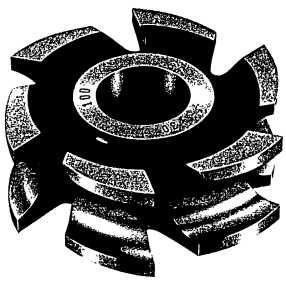
PROFILFRÄSER, Profil Nr. 10, mit hintergedrehten Zähnen.

FRAISE DE PROFIL, profil No 10 avec tranchants détalonnés.

FRESA DE PERFIL, perfil No 10 con corte despejado.



207 B/1800



ø	inches	3 3/8"	3 3/8"	3 3/8"	3 3/8"	3 3/8"	3 3/8"	3 3/8"	3 3/8"	3 3/8"	3 3/8"
	mm	80	80	80	80	80	80	80	80	80	80
width	inches	5/16"	3/8"	15/32"	1/2"	5/8"	11/16"	13/16"	20/32"	1 1/16"	1 5/8"
Breite / largeur / anchura	mm	8	10	12	13	16	18	20	23	30	35
boring	inches	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"
Bohrung / alésage / agujero	mm	25	25	25	25	25	25	25	25	25	25

ø	inches	4"				4 3/4"								6 1/2"
	mm	100				100				120				140
width	inches	5/16"	3/8"	5/32"	1/2"	5/8"	11/16"	13/16"	20/32"	1 1/16"	1 3/8"	1 5/8"	2 1/16"	2 3/8"
Breite / largeur / anchura	mm	8	10	12	13	16	18	20	23	30	35	40	52	60
boring	inches				1"				1 3/16"		1 3/16"			1 3/16"
Bohrung / alésage / agujero	mm				25				30		30			30

Packing: according order / Verpackung: laut Bestellung / Emballage: selon commande / Embalaje: según pedido

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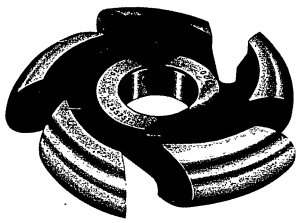
208 B/1800

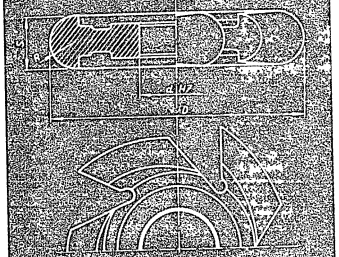


PROFILE WOODCUTTER, profile No. 17 with backed-off edges.

PROFILFRÄSER, Profil Nr. 17, mit hintergedrehten Zähnen.

FRAISE DE PROFIL, profil No. 17, avec tranchant détalonnés.

FRESA DE PERFIL, perfil No. 17, con corte despejado.



ø	inches	3 1/8"	3 1/8"	3 1/8"	3 1/8"	3 1/8"	3 1/8"	3 1/8"	3 1/8"	4"	4"	4"	4"	4"	4"
	mm	80	80	80	80	80	80	80	80	100	100	100	100	100	100
width Breite / largeur anchura	inches	5/32"	3/16"	1/4"	9/32"	5/16"	3/8"	15/32"	19/32"	5/32"	3/16"	1/4"	9/32"	5/16"	3/8"
	mm	4	5	6	7	8	10	12	15	4	5	6	7	8	10
boring Bohrung / alésago agujero	inches	1"	1"	1"	1"	1"	1"	1"	1"			1 1/16"			
	mm	25	25	25	25	25	25	25	25	30	30	30	30	30	30

ø	inches	4"	4 1/4"	4 3/4"	4 3/4"	4 3/4"		5 1/2"
	mm	100	100	100	120	120	120	140
width Breite / largeur anchura	inches	16/32"	18/32"	13/16"	1"	1 3/16"	1 5/8"	1 5/8"
	mm	12	15	20	25	30	35	40
boring Bohrung / alésago agujero	inches	1 3/16"	1 3/16"	1 3/16"	1 3/16"	1 3/16"	1 3/16"	1 3/16"
	mm	30	30	30	30	30	30	30

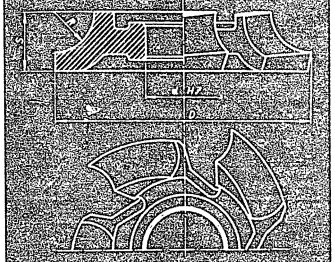
Packing: according order / Verpackung: laut Bestellung / Emballage: selon commande / Embalaje: según pedido

PROFILE WOODCUTTER, profile No. 14 with backed-off edges.

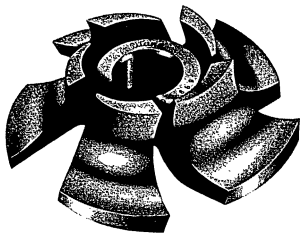
PROFILFRÄSER, Profil Nr. 14, mit hintergedrehten Zähnen.

FRAISE DE PROFIL, profil No. 14, avec tranchants détalonnés.

FRESA DE PERFIL, perfil No. 14, con corte despejado.



209 B/1800



ø	inches				4"				4 3/4"
	mm				100				120
width Breite / largeur anchura	inches	11/32"	3/8"	7/16"	15/32"	4/16"	11/16"	13/16"	13/16"	1 5/32"
	mm	9	10	11	12	14	18	20	24	29
boring Bohrung / alésago agujero	inches					1 3/16"	(1")			
	mm					30	(25)			

ø	inches	5 1/2"	5 1/2"	6 1/4"	7 1/8"	8"	8 3/4"
	mm	140	140	160	180	200	220
width Breite / largeur anchura	inches	1 3/8"	1 28/32"	2 1/32"	2 7/16"	2 7/8"	3 3/8"
	mm	36	41	51	63	73	86
boring Bohrung / alésago agujero	inches			1 3/16"	(1")		
	mm			30	(25)		

Packing: according order / Verpackung: laut Bestellung / Emballage: selon commande
Embalaje: según pedido

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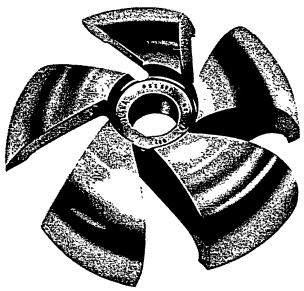
210 B/1800

PROFILE WOODCUTTER, profile No. 15 with backed-off edges.

PROFILFRÄSER, Profil - Nr. 15, mit hintergedrehten Zähnen.

FRAISE DE PROFIL, profil - No. 15 avec tranchants détalonnés.

FRESA DE PERFIL, perfil - No. 15 con cortes despejados.



⌀	inches	4"	4"	4"	4"	4"	4"	4"	4"	4 3/4"
	mm	100	100	100	100	100	100	100	100	120
width	inches	11/32"	3/8"	7/16"	15/32"	4/16"	11/16"	13/16"	13/16"	1 5/32"
Breite / largeur / anchura	mm	9	10	11	12	14	18	20	24	29
boring	inches	1 3/16"	(1")							
Bohrung / alésage / agujero	mm	30	(25)							

⌀	inches	5 1/2"	5 1/2"	6 1/4"	7 1/8"	8"	8 3/4"
	mm	140	140	160	180	200	220
width	inches	1 3/8"	1 23/32"	21/32"	2 7/16"	2 7/8"	3 3/8"
Breite / largeur / anchura	mm	36	41	51	63	73	86

Packing: according order / Verpackung: laut Bestellung / Emballage: selon commande / Embalaje: según pedido

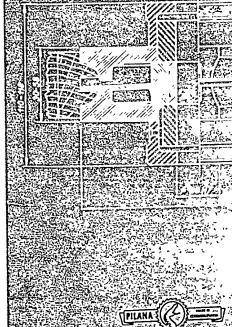
PILANA

SET OF CUTTERS FOR DOOR PROFILES with backed-off edges: 2 pcs. profile cutters, 1 piece sawivelling saw, 1 piece spherical case, 1 adapter, 2 adjustable screws and 2 piece outside boxes.

MESSERGARNITUR FÜR TÜRENPROFIL mit hintergedrehten Schärfen: 2 Stück Profilfräser, 1 Stück Wendesäge, 1 Stück kugelförmige Kapsel, 1 Stück Zuhaltung, 2 Stück verstellbare Schrauben und 2 Stück Außenkapseln.

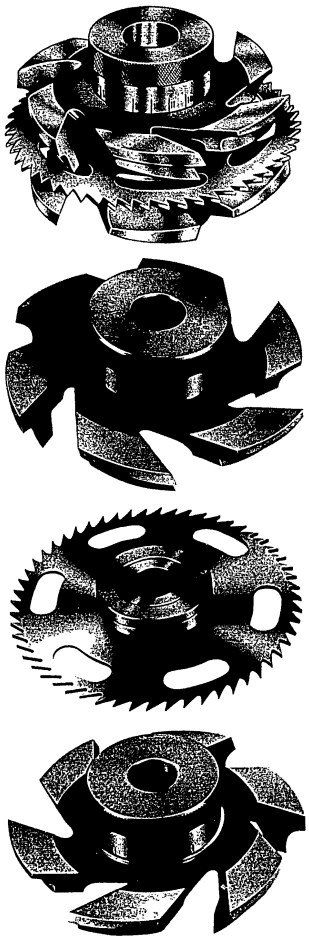
GROUPE DES FRAISES POUR PORTES avec dents détalonnés: 2 pièces fraises-profile, 1 pièce scie oscillante, 1 pièce étui sphérique, 1 raccord, 2 pièces vis réglables et 2 pièces des étuis extérieurs.

EL GRUPO DE FRESAS PARA PUERTAS con dientes despejados: 2 piezas fresas de perfil, 1 sierra vacilanda, 1 pieza cápsula esférica, 1 conector, 2 tornillos ajustables y 2 cápsulas de fuera.



PILANA

211 B/1815



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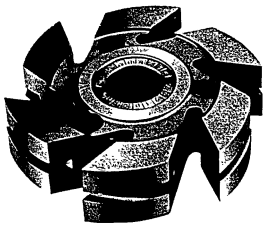
212 B/1855/6



SET OF CUTTERS FOR DIRIGIBLE SPRINGS with backed-off edges. Consists of 2 profile-cutters, 1 dirigible case and 3 screws.

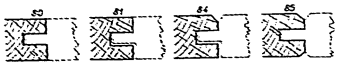
LENKBARE FEDERMESSERGARNITUR mit hintergedrehten Zähnen. Besteht aus 2 Profilfräsern, 1 Stück lenkbare Kapsel und 3 Schrauben.

RÉGLABLE GROUPE DES FRAISES À RESSORT avec dents détalonnés. Composée de 2 pièces fraises-profils, 1 pièce étui réglable et 3 vis.

GRUPO DE FRESAS DIRIGIBLE PARA RESORTES con dientes despejados. Consiste de 2 fresas de perfil, 1 cápsula dirigible y 3 tornillos.

ø	inches	5 1/2"	6 1/4"	7 1/8"	
	mm	140	160	180	
thickness of wood Dicke von Holz épaisseur de bois grueso de madera	inches	11/32"—7/8"	mm	15—22	
		7/8"—1 3/8"		22—37	
		1 3/8"—2"		37—50	
boring Bohrung / alésage / agujero	inches	1 3/16"	1 3/4"	2 3/8"	
	mm	30	45	60	

213 B/1855/6



DIRIGIBLE SET OF CUTTERS FOR GROOVES with backed-off edges. Consists of 2 profile-cutters, 1 dirigible case and 3 screws.

LENKBARE NUTENFRÄSERGARNITUR mit untergeschliffenen Zähnen. Besteht aus 2 Profilfräsern, 1 Stück lenkbare Kapsel und 3 Schrauben.

RÉGLABLE GROUPE DE FRAISES À RAINURER avec dents détalonnés. Composée de 2 pièces fraises-profils, 1 pièce étui réglable et 3 vis.

GRUPO DE FRESAS DIRIGIBLES PARA RANURAR con dientes despejados. Consiste de 2 fresas de perfil, 1 cápsula dirigible y 3 tornillos.

ø	inches	5 1/2"	6 1/4"	7 1/8"	
	mm	140	160	180	
thickness of wood Dicke von Holz épaisseur de bois grueso de madera	inches	11/32"—7/8"	mm	15—22	
		7/8"—1 3/8"		22—37	
		1 3/8"—2"		37—50	
boring Bohrung / alésage / agujero	inches	1 3/16"	1 3/4"	2 3/8"	
	mm	30	45	60	

SET OF CUTTERS FOR PRODUCING THE WINDOW-FRAMES with backed-off edges. The set consists of 2 profile-cutters, 1 piece double dirigible inserted ring and at the profiles No 21, 22, 24 and 25 running ring with box.

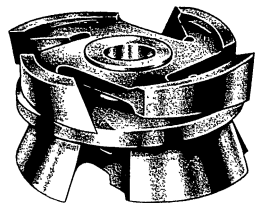
MESSERGARNITUR FÜR FENSTERPROFILE, die Fräser mit hintergedrehten Schäften. Die Garnitur besteht aus 2 Profilfräsern, 1 Stück zweiteiligem lenkbarem Zwischenring und bei Profil Nr. 21, 22, 24 und 25 aus Anlaufring mit Kapsel.

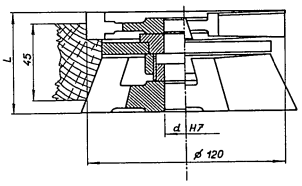
GROUPE DES FRAISES POUR FENÊTRES, les fraises avec dents détalonnés. Le groupe se compose de 2 fraises-profils, 1 pièce double anneau inséré réglable et chez profils No 21, 22, 24 et 25 anneau courant avec boîte.

EL GRUPO DE FRESAS PARA VENTANAS, con dientes despejados. El grupo consiste de 2 fresas de perfil, 1 pieza de anillo doble interpuesto dirigible y en las perfiles No 21, 22, 24 y 25 anillo corriente con cápsula.

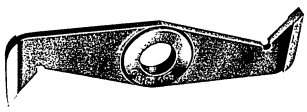
TENONING CUTTER.
ZAPFENFRÄSER.
FRAISE À TENONER.
FRESA ESPIGADORA.

214 B/1820





215 B/225740



ø	inches	10"	10"	10"	10"	10"	10"	10"	12"
	mm	250	250	250	250	250	250	250	300

width	inches	5/16"	3/8"	15/32"	9/16"	19/32"	5/8"	11/16"	13/16"
		12"	12"	12"	12"	12"	12"	12"	12"
		300	300	300	300	300	300	300	300
		3/8"	45/32"	19/16"	19/32"	5/8"	11/16"	13/16"	15/16"
Breite / largeur / anchura	mm	8	10	12	14	15	16	18	20
		10	12	14	15	16	18	20	24

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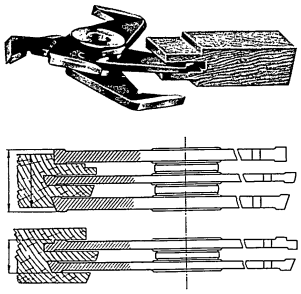
216 B/834

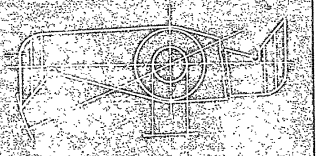


SET OF TENONING CUTTERS FOR WINDOWS, profile-cutters with double edge, teeth cut; consists of 5 cutters and 3 inserted rings.

ZAPFENFRÄSERGARNITUR FÜR FENSTER. Profilfräser mit Doppelschneide und gefrästen Schärfen; besteht aus 5 Stück Fräsern und 3 Zwischenringen.

GROUPE DE FRAISES À TENONER POUR FENÊTRES, fraises-profils avec tranchant double et dents fraisés. Elle est composée de 5 fraises et 2 anneaux insérés.

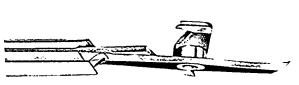
GRUPO DE FRESAS ESPIGADORAS PARA VENTANAS; fresas de perfil, con filo doble y dientes fresados. Grupo consiste de 5 fresas y 2 anillos interpuestos.

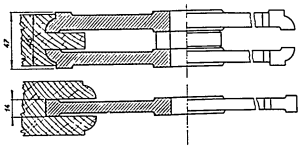


PROFILE SHAPES.
PROFILFORMEN.
FORMES DE PROFILS.
FORMAS DE PERFILES.

PILANA

217 B/835





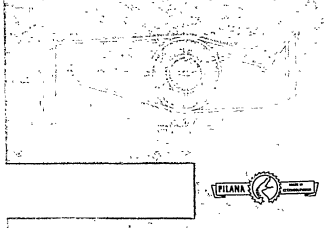
ø inches	10"	12"	14"	16"
mm	250	300	350	400

SET OF TENONING CUTTERS FOR DOORS, profile-cutters with double edge, teeth cut; consists of 3 profile-cutters and inserted ring.

ZAPFENFRÄSERGARNITUR FÜR TÜRE; Profilfräser mit Doppelschneide und gefrästen Schärfen; besteht aus 3 Profilfrästern und 1 Zwischenring.

GROUPE DE FRAISES À TENONER POUR PORTES; fraises-profils avec tranchant double et dents fraisés. Elle est composée de 3 fraises de profil et 1 anneau inséré.

GRUPO DE FRESAS ESPIGADORAS PARA PUERTAS; fresas de perfil con filo doble y dientes fresados. Grupo consiste de 3 fresas de perfil y 1 anillo interpuestos.



PILANA

PLANING HEAD COMPLETE — 3 KNIVES. Knives of cast iron steel, other parts of construction steel. Complete head consists of the body, 3 knives and corresponding number of teeth.

HOBELKOPF KOMPLETT — DREISCHNEIDIG. Die Messer aus Werkzeuggußstahl, andere Teile aus Konstruktionsstahl. Komplette Köpfe bestehen aus Körper, 3 Stück Messer und zugehöriger Anzahl der Schrauben.

LA TÊTE À RABOTER COMPLÈTE AVEC 3 COUTEAUX. Les couteaux d'acier-fonte pour outils, les autres parties d'acier de construction. La tête complète se compose du corps, 3 pièces de couteaux et quantité correspondente des vis.

LA CABEZA PARA ACEPILLAR COMPLETA CON 3 CUCHILLOS. Los cuchillos de acero colado para herramientas, otras partes de acero de construcción. La cabeza completa consiste del cuerpo, 3 cuchillos y número correspondiente de dientes.

	L		L_1		L_2	
mm	80		mm 20	3/4"	mm 40	1 1/2"
mm	100	4"	mm 25	1"	mm 50	2"
mm	120	4 3/4"	mm 20	3/4"	mm 40	1 1/2"
mm	150	6"	mm 25	1"	mm 50	2"
mm	200	8"	mm 25	1"	mm 50	2"

PILANA

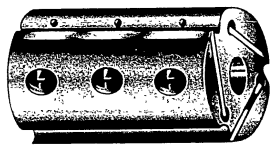
CUTTING HEAD FOR BIG GROOVES, with 3 knives and fore-cutting. The knives and fore-cutters of cast tool steel, other parts of construction steel. The complete head consists of the body, 3 pieces knives and 3 pairs of fore-cutters and fastening screws.

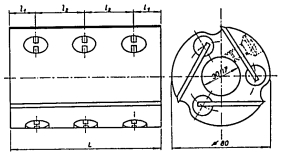
FALZENKOPF MIT 3 MESSER VORSCHNEIDEND. Die Messer und Vorschneider aus Werkzeuggußstahl, die restlichen Teile aus Konstruktionsstahl. Kompletter Kopf besteht aus Körper, 3 Messern und 3 Paare Vorschneider und Befestigungsschrauben.

LA TÊTE À GRANDES RAINURES AVEC 3 LAMES et coupe-avants. Les lames et coupe-avants d'acier fondu pour outils, les parties restantes d'acier de construction. La tête complète est composée du corps, 3 couteaux et 3 paires de coupe-avants et vis de fixation.

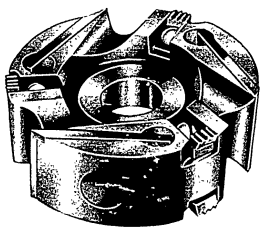
CABEZA PARA RANURAS GRUESAS con 3 cuchillos y cortadores previos. Los dientes y cortadores previos de acero colado para herramientas, las otras partes de acero de construcción. La cabeza completa consiste del cuerpo, 3 cuchillos y 3 pares de cortadores previos y tornillos para fijar.

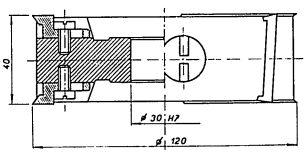
218 B/837





219 B/788





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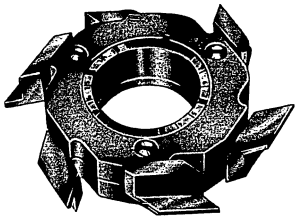
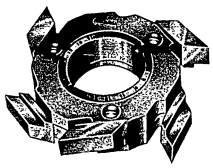
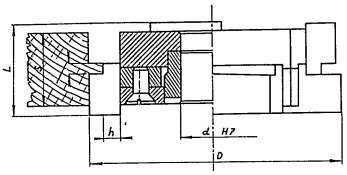
220 B/1851/52







DIRIGIBLE SET OF CUTTERS FOR SPRINGS AND GROOVES with inserted fraising teeth. The set consists of: 4 pieces flange, 6 pieces upper knives, 6 pieces lower knives, 2 pieces dirigible cases and 6 pieces screws. The supplementery knives can be ordered separately.

LENKBARE FRÄSENGARNITUR FÜR FEDER UND NIETEN, mit eingesetzten gefrästen Zähnen. Die Garnitur besteht aus: 4 Flanschen, 6 oberen Messern, 6 unteren Messern, 2 lenkbaren Kapseln und 6 Schrauben. Die Ersatzmesser können selbständig bestellt werden.

LE JEU RÉGLABLE DES FRAISES POUR RESSORTS ET RAINURES avec dents fraisés inserés. Le jeu se compose de: 4 bourrelets, 6 couteaux supérieurs, 6 couteaux inférieurs, 2 étuis réglables et 6 vis. Les couteaux de réchange peuvent être commandés à part.

JUEGO DIRIGIBLE DE FRESAS PARA RESORTES Y RANURAS con dientes interpuestos fresados. El juego consiste de: 4 enchufes, 6 cuchillos superiores, 6 cuchillos inferiores, 2 cápsulas dirigibles y 6 tornillos. Los cuchillos de repuesta pueden ser pedidos independientes.

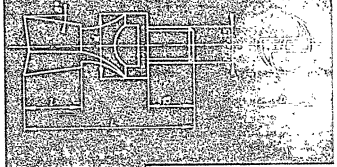
D	Š	d	l	L	h
140 *5 1/2"*	15-22 *19/32"-7/8"* 22-37 *7/8"-1 7/16"* 37-50 *1 7/16"-2"*	30 *1 3/16"*	4-7 *5/32"-9/32"* 5-9 *3/16"-3/8"* 8-14 *5/16"-9/16"*	36-39 *1 7/16"-1 9/16"* 41-45 *1 5/8"-1 3/4"* 52-58 *2 1/16"-2 1/4"*	9 *3/8"* 11 *7/16"* 15 *19/32"*
160 *6 1/4"*	15-22 *19/32"-7/8"* 22-37 *7/8"-1 7/16"* 37-50 *1 7/16"-2"*	45 *1 3/4*	4-7 *5/32"-9/32"* 5-9 *3/16"-3/8"* 8-14 *5/16"-9/16"*	36-39 *1 7/16"-1 9/16"* 41-45 *1 5/8"-1 3/4"* 52-58 *2 1/16"-2 1/4"*	9 *3/8"* 11 *7/16"* 15 *19/32"*
180 *7 1/8"*	15-22 *19/32"-7/8"* 22-37 *7/8"-1 7/16"* 37-50 *1 7/16"-2"*	60 *2 3/8"*	4-7 *5/32"-9/32"* 5-9 *3/16"-3/8"* 8-14 *5/16"-9/16"*	36-39 *1 7/16"-1 9/16"* 41-45 *1 5/8"-1 3/4"* 52-58 *2 1/16"-2 1/4"*	9 *3/8"* 11 *7/16"* 15 *19/32"*

DOVETAILING NORMAL CUTTER with thread-stem, without fore-cutters, of tool cast-steel.

NORMALER ZINKENFRÄSER mit Gewindestiel, ohne Vorschneider, aus Werkzeuggußstahl.

FRAISE NORMALE A QUEUES D'AIGLES avec tige filetée sans coupe-avants, d'acier fondu pour outils.

FRESA NORMAL DE EMPALMES con cabo de rocca, sin cortadores previos, de acero colado para herramientas.



ø inches	5/16"	3/8"	15/32"	1/2"	9/16"	19/32"	5/8"
mm	8	10	12	13	14	15	16

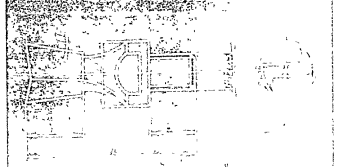
221 B/225773

DOVETAILING LENGTHENED CUTTER with thread-stem, without fore-cutters, of tool, cast-steel.

VERLÄNGERTER ZINKENFRÄSER mit Gewindestiel, ohne Vorschneider, aus Werkzeuggußstahl.

FRAISE ALLONGÉE A QUEUES D'AIGLES avec tige filetée, sans coupe-avants, d'acier fondu pour outils.

FRESA ALARGADA DE EMPALMES con cabo de rocca, sin cortadores previos, de acero colado para herramientas.



ø inches	5/16"	3/8"	15/32"	1/2"	9/16"	19/32"	5/8"
mm	8	10	12	13	14	15	16

222 B/D

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223 B

DOVETAILING CUTTER FOR MACHINES WITH SEVERAL SPINDLES, of tool cast-steel.

ZINKENFRÄSER FÜR MEHRSPINDLIGE ZINKEN-MASCHINE, aus Werkzeuggußstahl.

FRAISE À QUEUES D'AIGLES POUR MACHINES AVEC PLUSIEURES BROCHES, D'acier fondu pour outils.

FRESA DE EMPALMES PARA MAQUINAS DE ALGUNOS ARBOLES, de acero colado para herramientas.

ø inches	5/16″	3/8″	1/2″	5/8″	11/16″	21/32″	1 1/8″	1 9/32″
mm	8	10	13	16	18	23	28	33

224 B/225774

DOVETAILING CUTTER with cylindrical stem and fore-cutters, of tool cast-steel.

ZINKENFRÄSER mit Walzenstiel und mit Vorschneidern, aus Werkzeuggußstahl.

FRAISE À QUEUES D'AIGLES avec tige cylindrique et avec coupe-avants, d'acier fondu pour outils.

FRESA DE EMPALMES con cabo cilindrico y con cortadores previos, de acero colado para herramientas.

Division ø inches	19/32″	19/32″	7/8″	7/8″	1″	1″	1 5/32″	1 5/32″	1 5/32″	1 5/32″	1 3/8″	1 3/8″	1 3/8″
	3/8″	15/32″	15/32″	19/32″	19/32″	13/16″	5/8″	13/16″	1 1/32″	1 3/16″	7/8″	1 1/32″	1 1/4″
Teilung / division / division mm													
	15/10	15/12	22/12	22/15	25/15	25/20	29/16	29/20	29/26	29/30	37/22	37/26	37/32

ROLLING CUTTER with cylindrical stem and fore-cutters, for opened sharpedged dovetails.

WÄLZENFRÄSER mit Walzenstiel und Vorschneidern für offene, scharfkantige Zinken.

FRAISE À LAMINER avec tige cylindrique et coupe-avants pour queues d'aigles ouverte avec carnes aigues.

FRESA A LAMINAR con cabo cilindrico, con cortadores previos para empalmes abiertos de esquinas agudas.

225 B/225776

ø inches	5/16″	3/8″	7/16″	15/32″	9/16″	3/4″
mm	7,5	9,7	11	12	14,5	18,5

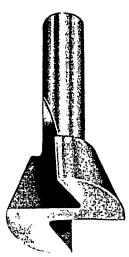
RIDGE CUTTER with cylindrical stem and foro-cutters, of tool cast-steel.

GRATFRÄSER mit Walzenstiel und mit Vorschneidern, aus Werkzeuggußstahl.

FRAISE À CLAIRE-VOIES avec tige cylindrique et avec coupe-avants, d'acier fondu pour outils.

FRESA PARA MUESCAS con cabo cilíndrico y con cortadores previos, de acero colado para herramientas.

226 B/225777



ø inches	3/8″	9/16″	21/32″	13/16″	29/32″	1 1/32″
mm	10	14	17	20	23	26

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227 B

RIDGE CUTTER with thread stem, without fore-cutters, of tool cast steel.

GRATFRÄSER mit Gewindestiel, ohne Vorschneider, aus Werkzeuggußstahl.

FRAISE À CLAIRE-VOIES avec tige de vis, sans coupe-avants, d'acier fondu pour outils.

FRESA PARA MUESCAS con cabo de filete, sin cortadores previos, de acero colado para herramientas.

ø inches	15/32"	1/2"	9/16"	19/32"	5/8"	21/32"
mm	12	13	14	15	16	17
ø inches	11/16"	13/16"	7/8"	1"	1 1/8"	1 3/16"
mm	18	20	22	25	28	30

228 B/225786

GROOVING CUTTER with cylindrical stem, of tool cast steel.

NUTENFRÄSER mit Walzenstiel, aus Werkzeuggußstahl.

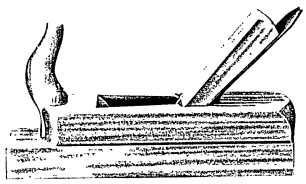
FRAISE À RAINURES avec tige cylindrique, d'acier fondu pour outils.

FRESA PARA RANURAS con filete cilíndrico, de acero colado para herramientas.

ø inches	1/8"	5/32"	3/16"	1/4"	4/32"	5/16"	11/32"	3/8"	15/32"
mm	3	4	5	6	7	8	9	10	12

PLANES · HOBEL · RABOTS · CEPILLOS

252 B/1



ROUGH PLANE, completely hornbeam or scalded beech with hornbeam sole, unvarnished or varnished and with varnished irons.

SCHRUBBHOBEL, komplett aus Hagebuche oder aus gebrühter Rotbuche mit Hagebuchesohle, unlackiert oder lackiert, mit lackiertem Eisen.

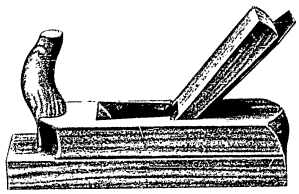
RIFLARD, complètement en charme ou hêtre échaudé avec semelle de charme, non verni ou verni et avec les fers vernis.

CEPILLO PARA DESBASTAR, completamente de ojaranzo o de haya escaldada con base de ojaranzo, no barnizado o barnizado y con hierros barnizados.

width of iron	inches	1 3/16"	1 9/32"	1 7/16"	1 9/16"
Eisenbreite / largeur de fer / anchura de hierro	mm	30	33	36	39
length	inches	10 1/8"	10 1/8"	10 1/8"	10 1/8"
Länge / longueur / largura	mm	255	255	255	255
weight	lbs	1/12	1/12	1/12	1/12
Gewicht / poids / peso	kgs	0,80	0,80	0,80	0,80

Packing: according agreement / Verpackung: laut Vereinbarung / Emballage: selon convention / Embalaje: según convención

253 B/2



SMOOTHING PLANE, completely hornbeam or scalded beech with hornbeam sole, unvarnished or varnished and with varnished irons.

SCHLICHTHOBEL, komplett aus Hagebuche oder aus gebrühter Rotbuche mit Hagebuchesohle, unlackiert oder lackiert, mit lackiertem Eisen.

RABOT À PLANER, complètement en charme ou hêtre échaudé avec semelle de charme, non verni ou verni et avec les fers vernis.

CEPILLO PARA ACABAR, completamente de ojaranzo o de haya escaldada con base de ojaranzo, no barnizado o barnizado y con hierros barnizados.

width	inches	1 11/16"	1 3/4"	1 7/8"	2 1/32"
Breite / largeur / anchura	mm	42	45	48	51
length	inches	10 1/8"	10 1/8"	10 1/8"	10 1/8"
Länge / longueur / largura	mm	255	255	255	255
weight	lbs	2/1	2/1	2/1	2/1
Gewicht / poids / peso	kgs	0,95	0,95	0,95	0,95

Packing: acording agreement / Verpackung: laut Vereinbarung / Emballage: selon convention / Embalaje: según convención

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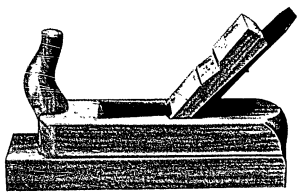
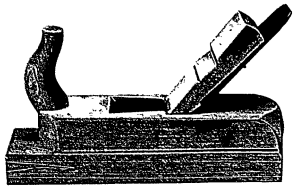
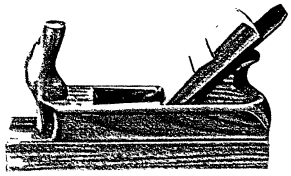
254 B/3







JACK PLANE, completely hornbeam or scalded beach with hornbeam sole, unvarnished or varnished and with varnished irons.

DOPPELHOBEL, komplett, aus Hagebuche oder aus gebrühter Rotbuche mit Hagebuchesohle, unlackiert oder lackiert, mit lackiertem Eisen.

RABOT DOUBLE, complètement en charme ou hêtre échaudé avec semelle de charme, non verni ou verni et avec les fers vernis.

CEPILLO DOBLE, completamente de ojaranzo o de haya escaldada con base de ojaranzo, no barnizado o barnizado y con hierros barnizados.

width Breite / largeur / anchura	inches	*1 11/16"*	*1 3/4"*	*1 7/8"*	*2 1/32"*
	mm	42	45	48	51
length Länge / longueur / largura	inches	*10 1/16"*	*10 1/16"*	*10 1/16"*	*10 1/16"*
	mm	255	255	255	255
weight Gewicht / poids / peso	lbs	*2*	*2/2*	*2/4*	*2/7*
	kgs	0,90	0,97	1,02	1,10

Packing: according agreement / Verpackung: laut Vereinbarung / Emballage: selon convention / Embalaje: según convención

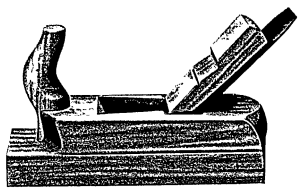
JACK PLANE SHORT, completely hornbeam or scalded beach with hornbeam sole, unvarnished or varnished and with varnished irons.

DOPPELHOBEL, KURZ, komplett aus Hagebuche oder aus gebrühter Rotbuche mit Hagebuchesohle, unlackiert oder lackiert, mit lackiertem Eisen.

RABOT DOUBLE COURT, complètement en charme ou hêtre échaudé avec semelle de charme, non verni ou verni et avec les fers vernis.

CEPILLO DOBLE CORTO, completamente de ojaranzo o de haya escaldada con base de ojaranzo, no barnizado o barnizado y con hierros barnizados.

255 B/3 A



width Breite / largeur / anchura	inches	*1 11/16"*	*1 3/4"*	*1 7/8"*	*2 1/32"*
	mm	42	45	48	51
length Länge / longueur / largura	inches	*10 1/8"*	*10 1/8"*	*10 1/8"*	*10 1/8"*
	mm	255	255	255	255
weight Gewicht / poids / peso	lbs	*2*	*2/2*	*2/4*	*2/7*
	kgs	0,90	0,97	1,02	1,10

Packing: according agreement / Verpackung: laut Vereinbarung / Emballage: selon convention / Embalaje: según convención

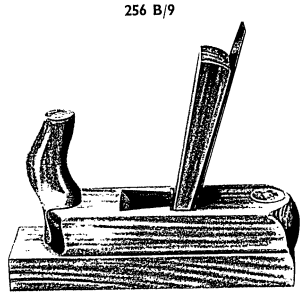
TOOTH PLANE, completely hornbeam or scalded beach with hornbeam sole, unvarnished or varnished and with varnished irons.

ZAHNHOBEL, komplett aus Hagebuche oder aus gebrühter Rotbuche mit Hagebuchesohle, unlackiert oder lackiert, mit lackiertem Eisen.

RABOT DENTÉ, complètement en charme ou hêtre échaudé avec semelle de charme, non verni ou verni et avec les fers vernis.

CEPILLO CON HIERRO DENTADO, completamente de ojaranzo o de haya escaldada con base de ojaranzo, no barnizado o barnizado y con hierros barnizados.

256 B/9



width Breite / largeur / anchura	inches	*1 11/16"*	*1 3/4"*	*1 7/8"*
	mm	42	45	48
length Länge / longueur / largura	inches	*10"*	*10"*	*10"*
	mm	250	250	250
weight Gewicht / poids / peso	lbs	*2*	*2*	*2*
	kgs	0,90	0,90	0,90

Packing: according agreement / Verpackung: laut Vereinbarung / Emballage: selon convention / Embalaje: según convención

All above mentioned planes can be delivered also with feet.
Alle oben angeführten Hobel können auch mit dem Fuß geliefert werden.
Tous les rabots mentionnés audessus peuvent être livrés aussi avec pied.
Todos cepillos arriba mencionados pueden ser entregados también con pie.

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257 B/6

TRYING PLANE of scalded beech with hornbeam sole, unvarnished or varnished. The plane iron is delivered according wish with short or long screw.

RAUHBANKHOBEL aus gebrühter Buche mit Hagebuchesohle, unlackiert oder lackiert. Das Hobeleisen wird auf Wunsch mit kurzer oder langer Schraube geliefert.

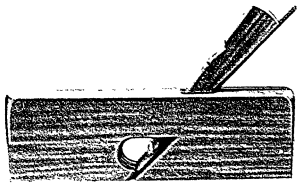
VARLOPE en hêtre échaudé avec semelle en charme. Non laqué ou laqué. Le fer de rabot livré selon désir avec vis court ou long.

GARLOPA de haya, escaldada con base de ojaranza, no barnizada o barnizada. El hierro de cepillo entregado según deseo con tornillo corto o largo.

width Breite / largeur / anchura	inches	*2 1/4"*	*2 3/8"*	*2 1/2"*
	mm	57	60	65
weight Gewicht / poids / peso	lbs	*6/10*	*6/13*	*7/1*
	kgs	3	3,1	3,3

Packing: according agreement / Verpackung: laut Vereinbarung / Emballage: selon convention / Embalaje: según convención

258 B 10



RABBET PLANE STRAIGHT of hornbeam wood, unvarnished or varnished with varnished iron.

SIMSHOBEL, GERADE, aus Hagebucheholz, unlackiert oder lackiert, mit lackiertem Eisen.

GUILLAUME DROIT en hêtre, non verni ou verni avec fers vernis.

GUILLAME DERECHO de madera de haya, no barnizado o barnizado, con hierros barnizados.

width Breite / largeur anchura	inches	*11/32"*	*15/32"*	*19/32"*	*11/16"*	*27/32"*	*15/16"*	*1 1/16"*	*1 3/16"*	*1 9/32"*
	mm	9	12	15	18	21	24	27	30	33
weight Gewicht / poids peso	oz	*13 1/2*	*14*	*14 1/3*	*14 2/3*	*15*	*15 1/3*	*15 2/3*	*15 2/3*	*16*
	kgs	0,38	0,39	0,40	0,41	0,42	0,43	0,44	0,44	0,45

Packing: according agreement / Verpackung: laut Vereinbarung / Emballage: selon convention / Embalaje: según convención

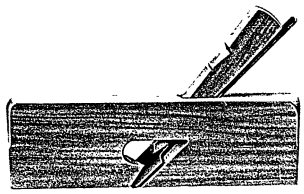
RABBET PLANE CROSS of hornbeam wood, unvarnished or varnished, with varnished iron.

SIMSHOBEL, SCHRÄG, aus Hagebucheholz, unlackiert oder lackiert, mit lackiertem Eisen.

GUILLAUME OBLIQUE en hêtre, non verni ou verni avec fers vernis.

GUILLAME OBLICUO de madera de haya, no barnizado o barnizado, con hierros barnizados.

259 B/11



width Breite / largeur anchura	inches	*11/32"*	*15/32"*	*19/32"*	*11/32"*	*27/32"*	*15/16"*	*1 1/16"*	*1 3/16"*	*1 9/32"*
	mm	9	12	15	18	21	24	27	30	33
weight Gewicht / poids peso	oz	*13 1/2*	*14*	*14 1/3*	*14 2/3*	*15*	*15 1/3*	*15 2/3*	*15 2/3*	*16*
	kgs	0,38	0,39	0,40	0,41	0,42	0,43	0,44	0,44	0,45

Packing: according agreement / Verpackung: laut Vereinbarung / Emballage: selon convention / Embalaje: según convención

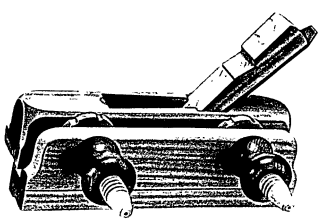
MOOVING FILISTER PLANE with 2 regulations of hornbeam wood. Unpolished or polished, with polished irons.

FALZHOBEL, VERSCHIEBBAR, mit 2 Stellungen, aus Hagebucheholz. Unpoliert oder poliert, mit poliertem Eisen.

FEUILLERET À MANOEUVRER avec 2 régulations en bois de charme. Non poli ou poli, avec fers polis.

REBAJADOR PARA DESPLAZAR con 2 reguladores en madera de ojaranza. No pulido o pulido, con hierros pulidos.

260 B/42



weight Gewicht / poids / peso	oz	*60 3/4*	
	kgs	1,42	

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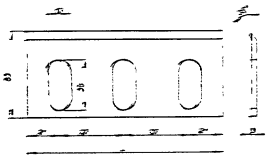
PLANING KNIVES - HOBELMESSER - FERS À RABOTER - HIERROS DE CEPILLAR

262 B 275613



PLANING KNIFE with closed gates for planing heads.

HOBELMESSER mit geschlossenen Einstellnuten für Hobelköpfe.

FER À RABOTER avec encoches fermées pour têtes à raboter.

HIERRO DE CEPILLAR con incisiones cerradas para cabezas para cepillar.

length / Länge / longueur / largura	inches	3 1/8"	4"	4 3/4"	6"	8"
	mm	80	100	120	150	200
width / Breite / largeur / anchura	inches	5/16"	5/16"	5/16"	5/16"	5/16"
	mm	8	8	8	8	8

263 B 755

THIN PLANE KNIFE.

SCHLEIFENHOBELMESSER.

RAINETTE.

HIERRO DELGADO PARA ACEPILLAR.

length / Länge / longueur / largura	inches	12 1/2"	16 1/2"	20 1/2"	24 1/2"	28 1/2"	32 1/2"	36 1/2"	40 1/2"	44 1/2"
	mm	320	420	520	620	720	820	920	1020	1120
width / Breite / largeur / anchura	inches	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 3/8"	1 3/8"
	mm	35	35	35	35	35	35	35	35	35
thickness / Dicke / épaisseur / grueso	inches	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"
	mm	3	3	3	3	3	3	3	3	3
weight / Gewicht / poids / peso	oz	8 1/2	11	14	16 1/2	19 1/2	22 1/2	25 3/4	28 3/4	33
	kgs	0,24	0,32	0,39	0,46	0,54	0,62	0,69	0,75	0,92

264 B 749

THICK PLANE KNIFE.

DICKTENHOBELMESSER.

COUTEAU LARGE À RABOTER.

CUCHILLA MECÁNICA PARA ACEPILLAR.

length / Länge / longueur / largura	inches	16-16 1/2"	20-20 1/2"	24-24 1/2"	28-28 1/2"	32-32 1/2"	36-36 1/2"
	mm	410-420	510-520	610-620	720-730	820-830	920-930
width / Breite / largeur / anchura	inches	3 1/16"	3 1/16"	3 1/16"	3 1/16"	3 1/16"	3 1/16"
	mm	80	80	80	80	80	80
thickness / Dicke / épaisseur / grueso	inches	5/16"	5/16"	5/16"	5/16"	5/16"	5/16"
	mm	8	8	8	8	8	8

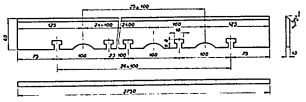
PRESSURE LEDGE.

DRUCKLEISTE.

LITEAU DE PRESSION.

LISTON DE PRESIÓN.

265 B



length / Länge / longueur / largura	feet	9'
	mm	2750
width / Breite / largeur / anchura	inches	2 3/8"
	mm	60
thickness / Dicke / épaisseur / grueso	inches	1/2"
	mm	13
weight / Gewicht / poids / peso	lbs	33
	kgs	15

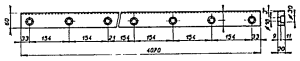
VENEER KNIFE.

FOURNIERMESSER.

COUTEAU DE PLACAGE.

CUCHILLO PARA CHAPAS.

266 B



length / Länge / longueur / largura	feet	13,1'
	mm	4000
width / Breite / largeur / anchura	inches	2 3/8"
	mm	60
thickness / Dicke / épaisseur / grueso	inches	13/16"
	mm	20
weight / Gewicht / poids / peso	lbs	81
	kgs	37

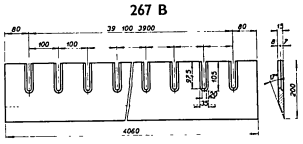
VENEER KNIFE.

FOURNIERMESSER.

COUTEAU DE PLACAGE.

CUCHILLO PARA CHAPAS.

267 B



length / Länge / longueur / largura	feet	13,3'
	mm	4060
width / Breite / largeur / anchura	inches	2 3/8"
	mm	60
thickness / Dicke / épaisseur / grueso	inches	13/16"
	mm	20
weight / Gewicht / poids / peso	lbs	198
	kgs	90

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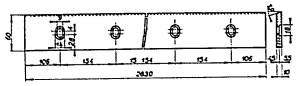
268 B



KNIFE FOR VENEER-CLIPPER.

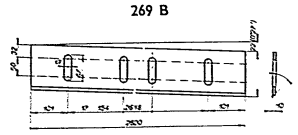
FOURNIERSCHERENMESSER.

COUTEAU POUR MASSICOT À PLACAGE.

CUCHILLO PARA TIJERAS DE CHAPAS.

length Länge / longueur / largura	feet mm	9/3" 2830
width Breite / largeur / anchura	inches mm	2 3/8" 60
thickness Dicke / épaisseur / grueso	inches mm	3/8" 10
weight Gewicht / poids / peso	lbs kgs	301 138

269 B



UPPER KNIFE FOR VENEER-CLIPPER.

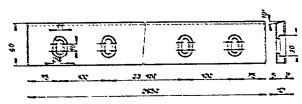
OBERES FOURNIERSCHERENMESSER.

COUTEAU SUPÉRIEUR POUR MASSICOT À PLACAGE.

CUCHILLO SUPERIOR PARA TIJERAS DE CHAPAS.

length Länge / longueur / largura	feet mm	9,2' 2820
width Breite / largeur / anchura	inches mm	4 3/4" 120
thickness Dicke / épaisseur / grueso	inches mm	3/8" 10
weight Gewicht / poids / peso	lbs kgs	52 23,6

270 B



KNIFE FOR VENEER-CLIPPER.

FOURNIERSCHERENMESSER.

COUTEAU POUR MASSICOT À PLACAGE.

CUCHILLO PARA TIJERAS DE CHAPAS.

length Länge / longueur / largura	feet mm	8,7' 2650
width Breite / largeur / anchura	inches mm	2 3/8" 60
thickness Dicke / épaisseur / grueso	inches mm	15/32" 12
weight Gewicht / poids / peso	lbs kgs	32 14,5

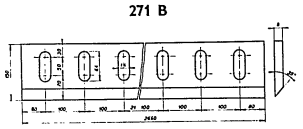
KNIFE FOR VENEER-CLIPPER.

FOURNIERSCHERENMESSER.

COUTEAU POUR MASSICOT À PLACAGE.

CUCHILLO PARA TIJERAS DE CHAPAS.

271 B



length Länge / longueur / largura	feet mm	8,8' 2660
width Breite / largeur / anchura	inches mm	6" 150
thickness Dicke / épaisseur / grueso	inches mm	5/16" 8
weight Gewicht / poids / peso	lbs kgs	51 23

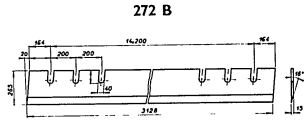
CUTTING KNIFE.

SCHNEIDEMESSER.

COUTEAU À COUPER.

CUCHILLO PARA CORTAR.

272 B



length Länge / longueur / largura	feet mm	10,3' 3148
width Breite / largeur / anchura	inches mm	10 1/2" 265
thickness Dicke / épaisseur / grueso	inches mm	19/32" 15
weight Gewicht / poids / peso	lbs kgs	198 90

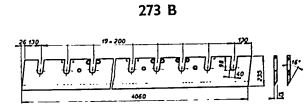
CUTTING KNIFE FOR VENEERS.

SCHNEIDEMESSER FÜR FOURNIERE.

COUTEAU À COUPER POUR LE PLACAGE.

CUCHILLO PARA CORTAR PARA CHAPAS.

273 B



length Länge / longueur / largura	feet mm	13,1' 9088
width Breite / largeur / anchura	inches mm	9 1/4" 235
thickness Dicke / épaisseur / grueso	inches mm	1 1/32" 15
weight Gewicht / poids / peso	lbs kgs	223 101

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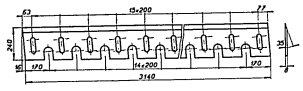
274 B



KNIFE FOR VENEER-SLICER.

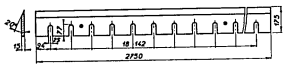
FOURNIERSCHNEIDEMESSER.

COUTEAU POUR TRANCHEUSE À PLACAGE.

CUCHILLO PARA REBANADORA PARA CHAPAS.

length Länge / longueur / largura	feet mm	10/4' 3156
width Breite / largeur / anchura	inches mm	9 1/2" 240
thickness Dicke / épaisseur / grueso	inches mm	5/16" 8
weight Gewicht / poids / peso	lbs kgs	85 38,40

275 B



PEELING KNIFE FOR VENEERS.

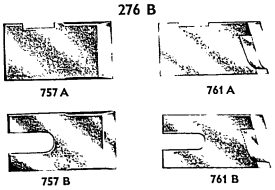
FOURNIERSCHÄLMESSER.

COUTEAU POUR DÉROULER LES PLAQUES.

CUCHILLO PARA DESENROLLAR LAS CHAPAS.

length Länge / longueur / largura	foot mm	9' 2750
width Breite / largeur / anchura	inches mm	7" 175
thickness Dicke / épaisseur / grueso	inches mm	19/32" 15
weight Gewicht / poids / peso	lbs kgs	102 46,5

276 B



PROFILE KNIVES.

PROFILMESSER.

COUTEAUX-PROFILS.

CUCHILLOS DE PERFIL.

normal thickness normale Dicke épaisseur normale grueso normal	inches mm	5/16" 8

Knives No 761 AB are used for profiles 14, 15, 16, 17, 21—23, 25, 31, 41, 42—44.

Messer Nr. 761 AB sind für Profile 14, 15, 16, 17, 21—23, 25, 31, 41, 42—44 benützt.

Couteaux No 761 AB sont utilisés pour profils 14, 15, 16, 17, 21—23, 25, 31, 41, 42—44.

Cuchillos No 761 AB están utilisados para perfiles 14, 15, 16, 17, 21—23, 25, 31, 41, 42—44.

PLANE IRONS · HOBELEISEN · FERS DE RABOTS · HIERROS DE CEPILLOS

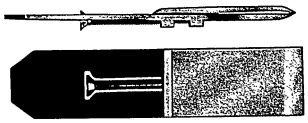
PLANE IRON WITH LOWER PART, execution A, of steel, with welded steeledge plate, screws and tenons. The lower part fitted up.

HOBELEISEN MIT UNTERTEIL, Ausführung A, aus Stahl mit geschweißter Stahlschneideplatte, Schrauben und Zapfen. Unterteil montiert.

FER DE RABOT AVEC PARTIE INFÉRIEURE, exécution A, d'acier, avec plaque de tranchant soudée d'acier, vis et boulons. Partie inférieure montée.

HIERRO DE CEPILLO CON PARTE INFERIOR, ejecución A, de acero, con plancha de filo de acero soldada, tornillos y espigas. Parte inferior montada.

279 B/750 K



width of iron Eisenbreite largeur de fer / anchura de hierro	inches	1 11/16"	1 3/4"	1 7/8"	2 1/32"	2 3/32"	2 1/4"
	mm	42	45	48	51	54	57
length of iron Eisenlänge longueur de fer / largura de hierro	inches	8"	8"	8"	8 1/2"	8 1/2"	8 1/2"
	mm	200	200	200	215	215	215
thickness of iron at the edge Eisendicke bei Schneide épaisseur de fer auprès tranchant grueso de hierro á filo	inches	3/32"	3/32"	3/32"	3/32"	3/32"	3/32"
	mm	2	2	2	2	2	2
thickness of iron at the end Eisendicke am Ende épaisseur de fer au bout grueso de hierro al cabo	inches	2 1/8"	2 1/8"	2 1/8"	2 3/8"	2 3/8"	2 3/8"
	mm	55	55	55	60	60	60
length of welded plate Länge von geschweißter Platte longueur de plaque soudée largura de plancha soldada							
weight Gewicht / poids / peso	oz	11 1/2"	12	13 2/3	15	16	17 1/2
	kgs	0,323	0,341	0,383	0,418	0,447	0,491

Packing: in cardboard-box per 12 pieces / Verpackung: in Pappschachteln à 12 Stück / Emballage: en boîte de carton à 12 pièces / Embalaje: en cartón de 12 piezas

DITTO, AMERICAN PATTERN, with short screw.

DETTO, AMERIKANISCHE TYPE, mit kurzer Schraube.

DETTO, MODÈLE AMERICAIN, avec vis court.

DETTO, MODELO AMERICANO, con tornillo corto.

280 B/750 AK

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281 B/753 K

UNCUT PLANE IRON.

SCHLICHTHOBELEISEN.

FER DE RABOTS SIMPLES.

HIERRO DE CEPILLOS SENCILLOS.

width of iron Eisenbreite largeur de fer anchura de hierro	inches	1 7/16"	1 9/16"	1 11/16"	1 3/4"	1 7/8"	2 1/32"	2 3/32"
	mm	36	39	42	45	48	51	54
length of iron Eisenlänge longueur de fer largura de hierro	inches	8"	8"	8"	8"	8"	8 1/2"	8 1/2"
	mm	200	200	200	200	200	215	215
thickness of iron at the edge Eisendicke bei Schneide épaisseur de fer auprès tranchant grueso de hierro á filo	inches	5/32"	5/32"	5/32"	5/32"	5/32"	3/16"	3/16"
	mm	4,5	4,5	4,5	4,5	4,5	5	5
thickness of iron at the end Eisendicke am Ende épaisseur de fer au bout grueso de hierro al cabo	inches	3/32"	3/32"	3/32"	3/32"	3/32"	3/32"	3/32"
	mm	2	2	2	2	2	2	2
length of welded plate Länge von geschweißter Platte longueur de plaque soudée largura de planda soldada	inches	2 3/8"	2 3/8"	2 3/8"	2 3/8"	2 3/8"	2 3/8"	2 3/8"
	mm	55	55	55	55	55	60	60
weight Gewicht / poids / peso	oz	6	6 3/16	7	8 3/4	8 3/4	9 1/2	10
	kgs	0,164	0,175	0,194	0,210	0,245	0,261	0,285

Packing: in cardboard box per 12 pieces / Verpackung: in Pappschachteln à 12 Stück / Emballage: en boîte de carton à 12 pièces / Embalaje: en cartón de 12 piezas

282 B/752 K

ROUND NOSE EDGE PLANE IRON of steel of quality, welded steeledge plate, sharpened.

SCHRUBBHOBELEISEN aus Qualitätsstahl, geschweißte Stahlschneideplatte, geschärft.

FER DE RIPLANE d'acier de qualité, plaque de frane nt d'acier soudée, aguisé.

HIERRO DE CEPILLO PARA DESBASTAR en a de calidad, plancha de filo de acero soldada, afilada.

width of iron Eisenbreite / largeur de fer anchura de hierro	inches	1 1/16"	1 3/16"	1 9/32"	1 7/16"	1 9/16"		
	mm	27	30	33	36	39		
length Länge / longueur / largura	inches	7 1/2"	7 1/2"	7 1/2"	7 1/2"	7 1/2"		
	mm	190	190	190	190	190		
thickness of iron at the edge Eisendicke bei Schneide épaisseur de fer auprès tranchant grueso de hierro á filo	inches	5/32"	5/32"	5/32"	5/32"	5/32"		
	mm	4,5	4,5	4,5	4,5	4,5		
thickness of iron at the end Eisendicke am Ende épaisseur de fer au bout grueso de hierro al cabo	inches	3/32"	3/32"	3/32"	3/32"	3/32"		
	mm	2	2	2	2	2		
length of welded plate Länge von geschweißter Platte longueur de plaque soudée largura de planda soldada	inches	2 1/8"	2 1/8"	2 1/8"	2 1/8"	2 1/8"		
	mm	55	55	55	55	55		
weight Gewicht / poids / peso 1 St	pc							
	oz	5 1/3	5 3/4	6 1/4	7	7 1/2		
	kgs	0,151	0,164	0,175	0,200	0,210		

Packing: in cardboard-box per 12 pieces / Verpackung: in Pappschachtel à 12 Stück / Emballage: en boîte de carton à 12 pièces / Embalaje: en cartón de 12 piezas

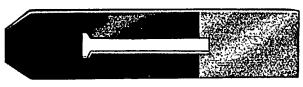
CUT PLANE IRON, AUSTRIAN MODEL.

LOCHHOBELEISEN, WIENER FORM.

FER DE RABOT PERCÉ, FAÇON VIENNOISE.

HIERRO DE CEPILLO ABIERTO, MODELO VIENNA.

283 B/751 K



width Breite / largeur / anchura	inches	1 11/16"	1 3/4"	1 7/8"	2 1/32"	2 3/32"	2 1/4"	2 3/8"
	mm	42	46	48	51	54	57	60
weight 1 dozen Gewicht 1 Dutzend poids 1 douzaine peso 1 docena	oz	85 2/3	94 1/3	98 1/2	108	116 2/3	128 1/2	141 1/2
	kgs	2,40	2,64	2,76	3	3,24	3,60	3,90

RABBET PLANE IRON.

SIMSHOBELEISEN.

FER DE GUILLAUME.

HIERRO DE GUILLAME.

284 B/758 K

width Breite / largeur / anchura	inches	11/16"	27/32"	15/16"	1 1/16"	1 3/16"	1 9/32"
	mm	18	21	24	27	30	33
weight 1 dozen Gewicht 1 Dutzend poids 1 douzaine peso 1 docena	oz	24	26	28	34	36	39
	kgs	0,66	0,72	0,78	0,96	1,—	1,10

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CHISELS - BEITEL - CISEAUX À BOIS · FORMONES

305 B/650 K

FIRMER CHISEL with round neck, of special steel, very elastic and tough, easy to be sharpened, maintains besides long time sharp edge.

STECHBEITEL mit rundem Hals, aus Spezialstahl, sehr elastisch und widerstandsfähig, leicht zu schärfen und dabei lange Zeit scharfe Schneide behaltend.

CISEAU À BOIS POUR MENUISIER, avec col rond, d'acier spécial, très élastique et tenace, facilement à aiguiser, conservant à la coupe très longtemps tranchant aigu.

FORMÓN con cuello redondo, de acero especial, mucho elástico y tenaz, fácil para afilar, guarda además largo tiempo filo agudo.

width	inches	3/32"	1/4"	5/32"	3/8"	15/32"	9/16"	5/8"	11/16"	13/16"	7/8"	15/16"	1 3/32"	1 3/16"	1 5/16"
Breite / largeur / anchura	mm	4	6	8	10	12	14	16	18	20	22	24	26	28	30
weight	oz	15/16	15/16	1	1 1/2	1 2/3	1 3/4	2 1/2	2 2/3	3 1/4	3 2/3	3 3/4	4 1/3	5	5 1/3
Gewicht / poids / peso	grs	23	26	29	41	44	50	68	76	89	103	105	121	166	170

Packing: in boxes per 5 or 10 pieces / Verpackung: in Schachteln à 5 oder 10 Stück / Emballage: en boîtes à 5 ou 10 pièces / Embalaje: en cajitas de 5 o 10 piezas

305 B/651 K

FIRMER CHISEL WITH BEVELLED EDGES.

STECHBEITEL MIT SEITENFASEN.

CISEAU À BOIS, BISEAUTÉ.

FORMÓN BISELADO.

width	inches	3/32"	1/4"	5/32"	3/8"	15/32"	9/16"	5/8"	11/16"	13/16"	7/8"	15/16"	1 3/32"	1 3/16"	1 5/
Breite / largeur / anchura	mm	4	6	8	10	12	14	16	18	20	22	24	26	28	30
weight	oz	3/4	3/4	15/16	1 1/4	1 1/2	1 3/4	2 1/2	2 1/2	3	3 1/3	3 1/2	4	5 1/2	5 2/
Gewicht / poids / peso	grs	16	21	26	36	39	44	62	69	82	93	98	113	157	161

Packing: in boxes per 5 or 10 pieces / Verpackung: in Schachteln à 5 oder 10 Stück / Emballage: en boîtes à 5 ou 10 pièces / Embalaje: en cajitas de 5 o 10 piezas

JOINERS' CHISEL bevelled with handle, of quality steel. Blade and neck sharpened, stem not worked. All surface painted with colourless varnish. Handle of wood.

TISCHLERBEITEL, mit Kanten, mit Heft, aus Qualitätsstahl. Klinge und Hals geschärft, Stiel nicht bearbeitet. Ganze Oberfläche mit farblosem Lack bestrichen. Heft aus Holz.

CISEAU À BOIS POUR MENUISIER biseauté avec manche, d'acier de qualité. Lame et col aiguisés, tige non travaillé. Surface totale peinte par vernis sans couleur. Manche en bois.

FORMÓN PARA CARPINTEROS, biselado, con mango, de acero de calidad. Cuchilla y cuello afilados, cabo no trabajado. Superficie entera teñida por barniz sin color. Mango de madera.

307 B/661 K

width	inches	5/32"	1/4"	5/16"	3/8"	15/32"	5/8"	13/16"	7/8"	1 1/32"	1 3/16"	1 1/4"	1 3/8"	1 5/8	
Breite / largeur / anchura	mm	4	6	8	10	12	16	20	22	26	30	32	35	40	
length	inches	6 1/8"	6 1/8"	7"	7"	7"	8"	8"	9 1/8"	9 1/8"	9 1/8"	9 1/8"	10 1/4"	10 1/4"	
Länge / longueur / largura	mm	155	155	175	175	175	200	200	230	230	230	230	260	260	
weight	oz	2 1/2	2 5/8	2 3/4	3 1/3	3 1/2	4 1/3	5	5 3/4	6 1/2	8 1/2	9	10	11	
Gewicht / poids / peso	kgs	69	71	76	95	99	122	144	164	181	240	256	282	305	

Packing: in cardboard-box per 10 pieces / Verpackung: in Pappschachteln à 10 Stück / Emballage: en boîtes de carton à 10 pièces / Embalaje: en cartón de 10 piezas

JOINERS' CHISEL unbevelled, with handle, of quality steel. Blade and neck sharpened, surface painted with colourless varnish, handle of wood, provided with steel ferrule and ring.

TISCHLERBEITEL, ohne Kanten, mit Heft, aus Qualitätsstahl. Klinge und Hals geschärft. Oberfläche mit farblosem Lack bestrichen, Heft aus Holz mit Stahlzwinge und Ring.

CISEAU À BOIS POUR MENUISIER, non biseauté, avec manche, d'acier de qualité. Lame et col aiguisés, surface peinte par vernis sans couleur, la manche en bois munie par virole d'acier et anneau.

FORMÓN PARA CARPINTEROS no biselado, con mango, de acero de calidad. Cuchilla y cuello afilado, superficie teñida por barniz sin color, el mango de madera, provedo por virola de acero y anillo.

308 B/660 K

length	inches	6 1/8"	6 1/8"	7"	7"	7"	8"	8"	9 1/8"	9 1/8"	9 1/8"	9 1/8"			
Länge / longueur / largura	mm	155	155	175	175	175	200	200	230	230	230	230			
width	inches	5/32"	1/4"	5/16"	3/8	15/32"	5/8"	13/16"	7/8"	1 1/32"	1 3/16"	1 1/4"			
Breite / largeur / anchura	mm	4	6	8	10	12	16	20	22	26	30	32			
weight	oz	2 1/2	2 2/3	2 3/4	3 1/2	3 2/3	4 1/2	5 1/3	6	6 3/4	8 2/3	9			
Gewicht / poids / peso	grs	72	75	78	100	104	128	151	172	190	244	258			

Packing: in cardboard-box per 10 pieces / Verpackung: in Pappschachteln à 10 Stück / Emballage: en boîtes de carton à 10 pièces / Embalaje: en cartón de 10 piezas

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309 B 668

CARPENTERS' CHISEL with handle, of quality steel. Blade and neck sharpened, stem not worked. All surface painted with colourless varnish. Handle of wood, provided with steel ferrule and ring.

ZIMMERMANNBEITEL mit Heft, aus Qualitätsstahl. Klinge und Hals geschärft, Stiel nicht bearbeitet. Ganze Oberfläche mit farblosem Lack bestrichen. Heft aus Holz, versehen mit Stahlzwinge und Ring.

CISEAU À BOIS POUR CHARPENTIER avec manche, d'acier de qualité. Lame et col aiguisés, tige non travaillée. Surface totale peinte par vernis sans couleur. Manche en bois, munie par virole en acier et anneau.

FORMÓN PARA CARPINTEROS con mango, de acero de calidad. Cuchilla y cuello afilados, cabo no trabajado. Superficie entera teñida por barniz sin color. Mango de madera, provisto por virola de acero y anillo.

width / Breite / largeur / anchura	inches	13/16"	7/8"	15/16"	1 1/32"	1 3/8"	1 3/16"	1 1/4"	1 5/16"	1 5/8"
	mm	20	22	24	26	28	30	32	35	40
lenght / Länge / longueur / largura	inches	9 1/2"	10 1/4"	10 1/4"	10 1/4"	10 1/4"	10 1/4"	10 1/4"	11"	11"
	mm	240	260	260	260	260	260	275	275	275
weight / Gewicht / poids / peso	oz	8	11	12	12 2/3	15	16 2/3	17 3/4	18 1/2	19
	grs	228	305	335	353	418	466	497	518	528

Packing: in cardboard-box per 10 pieces / Verpackung: in Pappschachtel à 10 Stück / Emballage: en boîtes de carton à 10 pièces / Embalaje: en cartón de 10 piezas

310 B 722 K

FIRMER GOUGE with interior edge, sharpened from the outside.

HOHLBEITEL mit innerer Schärfe, von außen geschärft.

GOUGE DE SCULPTEURS avec tranchant intérieur, niguisée extérieurement.

GUBIA PARA ESCULTORES con corto interior, afilada por fuera.

width: / Breite / largeur / anchura:	inches	1/4"	5/16"	3/8"	15/32"	9/16"	5/8"	11/16"	13/16"	7/8"	15/16"	1 1/32"	1 1/8"	1 3/16"
	mm	6	8	10	12	14	16	18	20	22	24	26	28	30
weight: / Gewicht / poids / peso	oz	3/4	13/16	1 1/2	1 2/3	1 3/4	2 1/2	2 2/3	3 2/3	4 1/2	5	5 1/8	6 1/2	6 5/8
	grs	21	23	43	47	52	71	76	103	126	139	141	181	183

Packing: in cardboard-box per 10 pieces / Verpackung: in Pappschachtel à 10 Stück / Emballage: en boîtes de carton à 10 pièces / Embalaje: en cartón de 10 piezas

311 B/722 AK

FIRMER GOUGE WITH HANDLE, of quality steel. Blade and neck sharpened, stem not worked. All surface painted with colourless varnish. Handle of wood, polished and provided with steel ferrule and ring.

HOHLBEITEL MIT HEFT, aus Qualitätsstahl. Klinge und Hals geschärft, Stiel nicht bearbeitet. Ganze Oberfläche mit farblosem Lack bestrichen. Heft aus Holz, poliert und versehen mit Stahlzwinge und Ring.

GOUGE DE SCULPTEUR AVEC MANCHE, d'acier de qualité. Lame et col aiguisés, tige non travaillée. Surface totale peinte par vernis sans couleur. Manche en bois, polie et munie par virole en acier et anneau.

GUBIA PARA ESCULTOR con mango, de acero de calidad. Cuchilla y cuello afilados, cabo no trabajado. Superficie entera teñida por barniz sin color. Mango de madera, pulido y provisto por virola de acero y anillo.

width / Breite / largeur / anchura	inches	1/4"	5/16"	3/8"	15/32"	5/8"	13/16"	7/8"	1 1/32"	1 1/16"
	mm	6	8	10	12	16	20	22	26	30
lenght / Länge / longueur / largura	inches	6 3/4"	6 3/4"	6 3/4"	7 1/4"	8"	8"	8 1/2"	8 1/2"	9 1/8"
	mm	170	170	185	185	200	200	215	215	230
weight / Gewicht / poids / peso	oz	2 1/2	3	3 3/4	4	4 2/3	5 3/4	7	7 1/2	8 3/4
	grs	70	83	102	107	131	163	195	210	248

Packing: in cardboard-box per 10 pieces / Verpackung: in Pappschachtel à 10 Stück / Emballage: en boîtes de carton à 10 pièces / Embalaje: en cartón de 10 piezas

312 B/731 K

PLUGGING CHISEL, double, 1 chip hole, all steel, very elastic and tough.

FITSCHENBEITEL, doppelt, 1 Spannloch, ganz Stahl, sehr elastisch und widerstandsfähig.

BÉDANE À FERRER, 1 encoche à 2 biseaux, complètement acier, très élastique et consistant.

ESCOPLO PARA HERRAR con 2 bisels, 1 hendidura, completamente acero, mucho elástico y tenaz.

thickness / Dicke / épaisseur / grueso	inches	1/16"	1/16"	1/16"	3/32"	3/32"	1/8"	
	mm	1	1	1,5	2	2,5	3	3,5
weight / Gewicht / poids / peso	oz	8 2/3	9 1/3	9 2/3	10	10 1/3	10 2/3	
	grs	243	263	269	279	290	302	

Packing: in cardboard-box per 10 pieces / Verpackung: in Pappschachtel à 10 Stück / Emballage: en boîtes de carton à 10 pièces / Embalaje: en cartón de 10 piezas

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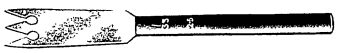
313 B/732 K



PLUGGING CHISEL, tridented, with 2 chip holes, all steel.

FITSCHENBEITEL, dreizackig, mit 2 Spanlöchern, ganz Stahl.

BÉDANE À FERRER à 3 fourchons et 2 encoches, complètement acier.

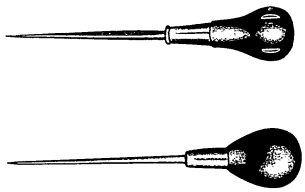
ESCOPLO PARA HERRAR, arrejaco con 2 hendiduras, completamente acero.

thickness	inches	*1/16"*	*1/16"*	*1/16"*	*3/32"*	*3/32"*	*1/8"*	
Dicke / épaisseur / grueso	mm	1	1	1,5	2	2,5	3	3,5
weight	oz	*8 2/3*	*9 1/3*	*9 2/3*	*10*	*10 1/3*	*10 2/3*	
Gewicht / poids / peso	grs	243	263	269	279	290	302	

Packing: in boxes per 10 pieces / Verpackung: in Schachteln à 10 Stück / Emballage: en boîtes à 10 pièces / Embalajo: en cajitas de 10 piezas

Railway-shipments in cases of maximal weight 60.
Eisenbahnsendungen in Kisten von Maximalgewicht 60 kg.
Envoi par chemin de fer en caisses de poids maximum 60 kg.
Envío por ferrocaril en cajas de peso máximum 60 kg.

314 B/674 K



JOINERS AWL FOR SCREWS.

TISCHLERLOCHER FÜR SCHRAUBEN.

ALÊNE DE MENUSIEURS POUR VIS.

PERFORADOR DE CARPINTEROS PARA TORNILLOS.

A) round, with pear-shaped handle.
rund mit birnenförmigem Heft.
rondo avec manche en forme de poire.
redondo con mango en forma de pera.

B) with 4 edges and red varnished egg-shaped handle riveted.
vierkantig, mit rotlackiertem, eiförmigem Heft, genietet.
avec 4 carnes et manche vernie rouge, en forme d'œuf, rivée.
con 4 esquinas y mango barnizado en rojo en forma de huevo, remachado.

length	inches	*7"*	*7 1/8"*
Länge / longueur / largura	mm	175	180

Packing: in boxes per 10 pieces / Verpackung: in Schachteln à 10 Stück / Emballage: en boîtes à 10 pièces / Embalajo: en cajitas de 10 piezas

DRAWING KNIFE WITH ROUND SHOULDERS, varnished handles.

WAGNERZUGMESSER MIT RUNDEN HÄLSEN, lackierte Griffe.

PLANE EVIDÉE À COUS RONDS, manches vernis.

RASCADOR PARA TONELERO CON CUELLOS REDONDOS, mangos barnizados.

315 B/744 K

length	inches	*7 1/8"*	*8"*	*8 3/8"*	*9 1/2"*	*10 1/4"*	*11 1/4"*	*12"*
Länge / longueur / largura	mm	180	200	220	240	260	280	300
weight	oz	*15*	*15 2/3*	*16 1/3*	*16 2/3*	*17*	*17 1/2*	*18*
Gewicht / poids / peso	grs	420	440	460	470	480	490	500

MORTISE CHISEL of quality steel. Blade and neck sharpened, stem not worked. All surface, painted with colourless varnish. Handle of wood, provided with steel ferrule and ring.

LOCHBEITEL aus Qualitätsstahl. Klinge und Hals geschärft, Stiel nicht bearbeitet. Ganze Oberfläche mit farblosem Lack bestrichen. Heft aus Holz, versehen mit Stahlzwinge und Ring.

BÉDANE d'acier de qualité. Lame et col aiguisés, tige non travaillée. Surface totale peinte par vernis sans couleur. Manche en bois, munie par virole en acier et anneau.

ESCOPLO de acero de calidad. Cuchilla y cuello afilados, cabo no trabajado. Superficie entera teñida por barniz sin color. Mango de madera, proveído por virola de acero y anillo.

316 B/671 K

width	inches	*1/8"*	*3/16"*	*1/4"*	*5/16"*	*3/8"*	*15/32"*	*1/2"*	*5/8"*	*13/16"*
Breite / largeur / anchura	mm	3	5	6	8	10	12	13	16	20
length	inches	*9 1/8"*	*9 1/8"*	*9 1/8"*	*9 5/8"*	*9 5/8"*	*10 1/4"*	*10 1/4"*	*11 1/4"*	*11 1/4"*
Länge / longueur / largura	mm	230	230	230	245	245	260	260	280	280
weight	oz	*4 3/4*	*6 1/4*	*7*	*8 1/2*	*10*	*12 1/2*	*14 3/4*	*15 3/4*	*16*
Gewicht / poids / peso	grs	134	175	195	238	278	351	414	446	453

Packing: in boxes per 10 pieces / Verpackung: in Schachteln à 10 Stück / Emballage: en boîtes à 10 pièces / Embalajo: en cajitas de 10 piezas.

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317 B/727

TURNING CHISEL, forged of quality steel. Blade sharpened, all surface painted by colourless varnish.

DRECHSLERMEISSEL, aus Qualitätstahl geschmiedet. Klinge geschärft, ganze Oberfläche mit farblosem Lack bestrichen.

CISEAU DE TOURNEURS, forgé d'acier de qualité. Lame aiguisée, surface totale peinte avec vernis sans couleur.

FORMÓN PARA TORNEADORES, forjado de acero de calidad. Hoja afilada, superficie entera teñida con barniz sin color.

width Breite largeur / anchura	inches	*1/4"*	*3/8"*	*15/32"*	*5/8"*	*13/16"*	*7/8"*	*1 1/32"*	*1 3/16"*	*1 1/4"*	*1 3/8"*	
	mm	6	10	12	16	20	22	26	30	32	35	
length Länge longueur / largura	inches	*9"*	*9"*	*9 5/8"*	*9 5/8"*	*9 5/8"*	*10 1/4"*	*10 1/4"*	*10 1/4"*	*11 1/4"*	*11 1/4"*	
	mm	225	225	245	245	245	260	260	260	280	280	

Packing: in boxes per 10 pieces / Verpackung: in Schachteln à 10 Stück / Emballage: en boîtes à 10 pièces / Embalaje: en cajitas de 10 piezas

318 B/728

TURNING GOUGE forged of quality steel. Blade sharpened, all surface painted by colourless varnish. For working the wood on the turning lath.

DRECHSLERRÖHRE, aus Qualitätstahl geschmiedet. Klinge geschärft, ganze Oberfläche mit farblosem Lack bestrichen. Für Bearbeitung des Holzes auf der Drehbank.

GOUGE DE TOURNEURS, forgée d'acier de qualité. Lame aiguisée, surface totale peinte avec vernis sans couleur. Pour travailler le bois sur le tour.

GUBIA PARA TORNEADORES, forjada de acero de calidad. Hoja afilada, superficie entera teñida con barniz sin color. Para trabajar la madera sobre el torno.

width Breite largeur anchura	inches	*1/4"*	*3/8"*	*15/32"*	*5/8"*	*13/16"*	*1 1/32"*	*1 3/16"*	*1 1/4"*	*1 3/8"*		
	mm	6	10	12	16	20	26	30	32	35		
length Länge longueur largura	inches	*9"*	*9"*	*9 5/8"*	*9 5/8"*	*9 5/8"*	*10 1/4"*	*10 1/4"*	*10 1/4"*	*10 1/4"*		
	mm	225	225	245	245	245	260	260	260	260		

Packing: in boxes per 10 pieces / Verpackung: in Schachteln à 10 Stück / Emballage: en boîtes à 10 pièces / Embalaje: en cajitas de 10 piezas

GIMLETS AND BITS · BOHRER · MÈCHES ET VRILLES · MECHAS Y BARENAS

CARPENTER'S AUGER WITH EYE FOR HANDLE, forged of quality steel, sharpened, back of edge and part of stem fine ground, the remaining surface varnished in black.

STANGEN-SCHNECKENBOHRER MIT OHR FÜR GRIFF, aus Qualitätsstahl geschmiedet, geschärft, Rücken von Klinge und Teil des Schaftes feingeschliffen, die restliche Oberfläche schwarz lackiert.

TARIÈRE AVEC DOUILLE POUR MANCHE forgée d'acier de qualité, aiguisée, le dos de la lame et une partie du tronc repassés finement, la surface restante vernie noire.

BARRENA PARA CARPINTERO CON OJO PARA MANGO, forjada de acero de calidad, afilada, lomo de la hoja y parte de la asta aguzada de manera fina, otra superficie barnizada en negro.

321 B/702 K

dimension Ausmessung / dimension dimensión	inches	*3/8"*	*1/2"*	*9/16"*	*5/8"*	*11/16"*	*13/16"*	*7/8"*	*15/16"*	*1"*	*1 1/8"*	*1 3/16"*	*1 1/4"*	*1 5/16"*	*1 7/16"*	*1 1/2"*	*1 9/16"*
	mm	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
ø of stem des Schaftes / du tronc de la asta	inches	*5/16"*	*11/32"*	*3/8"*	*2/5"*	*1/2"*	*9/16"*	*9/16"*	*5/8"*	*5/8"*	*21/32"*	*23/32"*	*23/32"*	*27/32"*	*27/32"*	*29/32"*	*29/32"*
	mm	7	9	10	11	12	14	14	16	16	17	19	19	21	21	23	23
length of boring part Länge des Bohrteiles longueur de la partie à forer largura de parte taladradora	inches	*3 1/5"*	*3 3/5"*	*4"*	*4 1/5"*	*4 2/5"*	*4 4/5"*	*5 1/5"*	*5 3/5"*	*6"*	*6 2/5"*	*6 4/5"*	*7 1/5"*	*7 2/5"*	*7 3/5"*	*7 4/5"*	*8"*
	mm	80	90	100	105	110	120	130	140	150	160	170	180	185	190	195	200
whole length ganze Länge longueur totale largura entera	inches	*10"*	*11"*	*12"*	*13"*	*14"*	*15"*	*16"*	*16 4/5"*	*17 3/5"*	*18 2/5"*	*19 1/5"*	*20"*	*20 3/5"*	*21 1/5"*	*21 4/5"*	*22"*
	mm	250	275	300	325	350	375	400	420	440	460	480	500	515	530	545	550
weight 1 pc Gewicht 1 St poids 1 pc / peso 1 pz	oz	*2 5/8*	*4 7/8*	*6 1/2*	*9*	*11 1/4*	*11 1/3*	*14 7/8*	*20 7/8*	*23 3/4*	*27 3/4*	*31 3/4*	*36*	*54*	*54*	*66*	*68*
	grs	73	137	182	254	315	317	415	585	666	777	888	1007	1507	1507	1847	1872

Packing: in cardboard-box per 5—10 pieces / Verpackung: in Pappschachtel à 5—10 Stück / Emballage: en boîte de carton à 5—10 pièces / Embalaje: en cartón á 5—10 piezas

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322 B/703 K

GIMLET BIT FOR BRACES WITH PYRAMIDAL SHANK of quality steel, sharpened, back of edge and part of stem fine ground, the remaining surface varnished in black.

SCHNECKENBOHRER FÜR BOHRWINDE, MIT PYRAMIDALSCHAFT, aus Qualitätsstahl geschmiedet, geschärft, Rücken von Klinge und Teile des Schaftes fein geschliffen, die restliche Oberfläche schwarz lackiert.

MÈCHE À FERRER POUR VILLEBREQUIN AVEC TIGE PYRAMIDAL d'acier de qualité, aiguisée, le dos de la lame et une partie du tronc repassée finement, la surface restante vernies noire.

BARRENA PARA HERRAR PARA BERBIQUÍ CON CABO DE PIRÁMIDE de acero de calidad, afilada, lomo de la hoja y parte de la asta aguzada de manera fina, otra superficie barnizada en negro.

dimension	inches	*1/12″*	*1/8″*	*1/6″*	*1/5″*	*1/4″*	*5/16″*	*2/7″*	*11/32″*	*3/8″*	*2/5″*	*1/2″*	*17/32″*	*9/16″*
Ausmessung / dimension / dimensión	mm	2	3	4	5	6	7	8	9	10	11	12	13	14
ø of stem	inches	*1/16″*	*1/9″*	*1/7″*	*1/6″*	*2/11″*	*1/5″*	*1/4″*	*5/16″*	*5/16″*	*2/7″*	*21/32″*	*21/32″*	*3/8″*
des Schaftes / du tronc de la asta	mm	1,8	2,7	3,5	4	4,5	5	6	7	7	8	9	9	10
length of boring part	inches	*1 1/5″*	*1 2/5″*	*1 3/5″*	*2″*	*2 1/5″*	*2 1/5″*	*2 2/5″*	*2 3/5″*	*2 3/5″*	*2 4/5″*	*3″*	*3 1/5″*	*3 2/5″*
Länge des Bohrteiles / longueur de la partie à forer / largura de parte taladradora	mm	30	35	40	50	55	55	60	65	65	70	75	80	85
whole length	inches	*4 2/5″*	*4 4/5″*	*5″*	*5 5/2″*	*5 3/5″*	*5 4/5″*	*6″*	*6 1/5″*	*6 2/5″*	*6 3/5″*	*6 4/5″*	*7″*	*7 1/5″*
ganze Länge / longueur totale / largura entera	mm	110	120	125	135	140	145	150	155	160	165	170	175	180
weight 1 pc	oz	*1/2*	*9/16*	*5/8*	*7/8*	*1 1/14*	*1 2/8*	*1 3/8*	*1 5/8*	*1 6/8*	*2*	*2 2/8*	*2 3/8*	*2 3/8*
Gewicht 1 St / poids 1 pc / peso 1 pz	grs	14	16	17	23	30	34	40	45	48	55	62	68	72

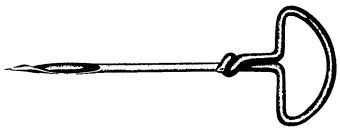
GIMLET WITH TWISTED RING HANDLE of quality steel, sharpened, back of edge and part of stem fine ground, the remaining surface varnished in black.

SCHNELLBOHRER MIT VERKNOTETEM RINGHEFT aus Qualitätsstahl geschmiedet, geschärft, Rücken von Klinge und Teil des Schaftes feingeschliffen, die restliche Oberfläche schwarz lackiert.

VRILLE AVEC MANCHE À ANNEAU TORDU d'acier de qualité, aiguisée, le dos de la lame et une partie du tronc repassée finement, la surface restante vernis noire.

BARRENITA CON MANGO EN FORMA DE ANILLO ENLAZADO de acero de calidad, afilada, lomo de la hoja y parte de la asta aguzada de manera fina, otra superficie barnizada en negro.

323 B/706 K



dimension	inches	*1/12″*	*1/8″*	*1/6″*	*1/5″*	*1/4″*	*5/16″*	*2/7″*	*11/32″*	*3/8″*	*2/5″*	*1/2″*
Ausmessung / dimension / dimensión	mm	2	3	4	5	6	7	8	9	10	11	12
ø of stem	inches	*1/16″*	*1/9″*	*1/7″*	*1/6″*	*1/5″*	*1/5″*	*1/4″*	*5/16″*	*5/16″*	*4/7″*	*4/7″*
des Schaftes / du trone / de la asta	mm	1,8	2,7	3,5	4	5	5	6	7	7	8	8
length of boring part	inches	*1 1/5″*	*1 2/5″*	*1 3/5″*	*2″*	*2 1/5″*	*2 1/5″*	*2 2/5″*	*2 3/5″*	*2 3/5″*	*2 4/5″*	*3″*
Länge des Bohrteiles / longueur de la partie à forer / largura de parte taladradora	mm	30	35	40	50	55	55	60	65	65	70	75
whole length	inches	*4 2/5″*	*5″*		*5 3/5″*	*6 1/5″*	*6 2/5″*	*7 1/5″*	*7 3/5″*	*8 2/5″*	*8 2/5″*	*9 3/5″*	*9 3/5″*
ganze Länge / longueur totale / largura entera	mm	110	125	140	155	160	180	190	210	210	240	240
weight 1 pc	oz	*1/6*	*3/8*	*2/3*	*1 1/8*	*1 1/2*	*2*	*3 1/8*	*3 2/8*	*4 1/2*	*4 3/4*	*5*
Gewicht / poids / peso 1 St pc pz	grs	5	11	20	32	41	57	87	92	127	134	142

Packing: in cardboard-box per 5—10 pieces / Verpackung: in Pappschachteln à 5—10 Stück / Emballage: en boîte de carton à 5—10 pièces / Embalaje: en cartón á 5—10 piezas

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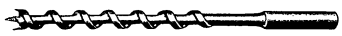
324 B/716 K



BIT IRWIN FOR BORING MACHINE, double lips, with cylindrical shank, of quality steel, surface polished, shank not worked, painted with coloured varnish. For boring the holes across the fibre of wood.

IRWIN MASCHINEN-SCHLANGENBOHRER, zweischneidig, mit Zylinderstange, aus Qualitätsstahl, Oberfläche poliert, Stange nicht bearbeitet, mit farbigem Lack bestrichen. Für Bohren von Löchern quer der Holzfasern.

MÈCHE TORSE POUR MACHINES, FAÇON IRWIN, à double traçoirs, avec tige cylindrique, d'acier de qualité, la surface polie, tige non travaillée, peinte avec vernis de couleur. Pour forer les trous en travers de la fibre de bois.

BARRENA SALAMÓNICA PARA MÁQUINAS MODELO IRWIN, con cuchillos dobles, con asta cilíndrica, de acero de calidad, superficie pulida, asta no trabajada, teñida con barniz colorado. Para taladrar las aberturas al través de los hilos de madera.

dimension / Ausmessung / dimensión	inches	3/8″	2/5″	1/2″	17/32″	9/16″	5/8″	11/16″	13/16″	7/8″	15/16″	1 1/16″	1 1/8″	1 3/16″
	mm	10	11	12	13	14	16	18	20	22	24	26	28	30
ø of stem / des Schaftes / du tronc / de la asta	inches	2/7″	2/7″	3/5″	3/8″	2/5″	1/2″	1/2	9/16″	19/32″	21/32″	11/16″	13/16″	7/8″
	mm	8	8	10	10	11	12	12	14	15	17	18	20	22
length of thread / Länge des Gewindes / longueur de spiro / largura de filete	inches	6″			9 1/5″									
	mm	150			230									
whole length / ganze Länge / longueur totale / largura entera	inches	8 4/5″			12″									
	mm	220			300									
weight 1 pc / Gewicht 1 St / poids 1 pc / peso 1 pz	oz	1/2	1/2	4/7	4/7	3/4	7/8	7/8	1 2/8	1 3/8	1 3/4	2		
	grs	13	13	16	16	20	24	24	35	40	48	55		

Packing: in cardboard-box per 5-10 pieces / Verpackung: in Pappschachtel à 5—10 Stück
Emballage: en boîte de carton à 5—10 pièces / Embalajo: en cartón a 5—10 piezas

AUGER BIT IRWIN FOR BRACES, with pyramidal shank, forged of quality steel, surface polished, shank not worked, painted with coloured varnish. For boring the holes across the fibre of wood.

SCHLANGENBOHRER IRWIN FÜR BOHRWINDE mit Pyramidstange, geschmiedet aus Qualitätsstahl, Oberfläche poliert, Stange nicht bearbeitet, mit farbigem Lack bestrichen. Für Bohren von Löchern quer der Holzfasern.

MÈCHE TORSE FAÇON IRWIN POUR VILLEBREQUIN avec tige pyramidal, forgé d'acier de qualité, la surface polie, tige non travaillée, peinte avec vernis de couleur. Pour forer les trous en travers de la fibre de bois.

BARRENA SALAMÓNICA MODELO IRWIN PARA BERBIQUÍ con asta de pirámide, forjada de acero de calidad, superficie pulida, asta no trabajada, teñida con barniz colorado. Para taladrar las aberturas al través de los hilos de madera.

325 B/717 K

dimension / Ausmessung / dimensión	inches	1/4″	2/7″	3/8″	1/2″	9/16″	5/8″	11/16″	13/16″	7/8″	15/16″	1 1/16″	1 5/8″	1 3/16″
	mm	6	8	10	12	14	16	18	20	22	24	26	28	30
ø of stem / des Schaftes / du tronc / de la asta	inches	2/11″	2/9″	2/9″	3/11″	3/11″	3/10″	3/10″	3/10″	3/9″	3/9″	4/11″	4/11″	4/11″
	mm	4,5	5,5	5,5	6,5	6,5	7,5	7,5	7,5	8,5	8,5	9,5	9,5	9,5
length of thread / Länge des Gewindes / longueur de spire / largura de filete	inches	3 4/5″	3 4/5″	4″	4 1/5″	4 2/5″	4 3/5″	4 3/5″	4 4/5″	4 4/5″	4 4/5″	5″	5 1/5″	5 2/5″	5 4/5″
	mm	95	95	100	105	110	115	115	120	120	125	130	135	140	
whole length / ganze Länge / longueur totale / largura entera	inches	7 2/5″	7 3/5″	7 4/5″	8″	8 2/5″	8 3/5″	8 4/5″	9″	9 1/5″	9 2/5″	9 3/5″	9 4/5″	10″	
	mm	185	190	195	200	210	215	220	225	230	235	240	245	250	
weight 1 pc / Gewicht 1 St. / poids 1 pc / peso 1 pz	oz	1	1 1/6	1 3/4	2 3/8	2 1/2	3 1/2	3 7/8	4 1/8	5 1/2	5 3/4	6 2/8	6 3/4	6 7/8	
	grs	27	33	48	62	74	97	108	115	156	161	173	183	190	

Packing: in cardboard-box per 5—10 pieces / Verpackung: in Pappschachtel à 5—10 Stück /
Emballage: en boîte de carton à 5—10 pièces / Embalaje: en cartón a 5—10 piezas

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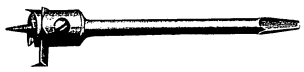
326 B/136 R



EXPANSION BIT with exchangeables cutters.

VERSTELLBARER BOHRER mit wechselbaren Spitzen.

MÈCHE EXTENSIBLE avec lames interchangeables.

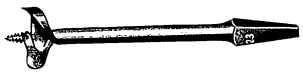
BARRENA AJUSTABLE con hojas cambiables.

size				
Größe / grandeur / tamaño	inches	5/8" — 1"	7/8" — 3 1/8"	1 1/32" — 4"
	mm	16—25	22—80	26—100
weight	lbs	1/1	1/8	2
Gewicht / poids / peso	kgs	0,48	0,68	0,89

Packing: in cardboard-box per 10 pieces / Verpackung: in Pappschachteln à 10 Stück / Emballage: dans boîtes de carton à 10 pièces / Embalaje: en cartones de 10 piezas

PILANA

327 B/709 K



CENTRE BIT EXCELSIOR.

SPITZBOHRER EXCELSIOR.

MÈCHE À TROIS POINTES EXCELSIOR.

BARRENA DE TRES PUNTAS EXCELSIOR.

size	inches	3/8"	15/32"	9/16"	5/8"	11/16"	13/16"	7/8"	15/16"	1 1/32"	1 1/8"	1 3/16"	1 1/4"	1 5/16"	1 7/16"	1 1/2"	1 5/8"
Größe / grandeur / tamaño	mm	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
weight	oz	1/4	1/3	1/3	1/3	2/3	2/3	2	2	2 1/2	3	3 1/4	3 1/4	4	5 1/3	5 2/3	
Gewicht / poids / peso	grs	0,03	0,03	0,04	0,04	0,05	0,05	0,05	0,06	0,06	0,07	0,08	0,09	0,09	0,12	0,15	0,16

Packing: in cardboard-box per 10 pieces / Verpackung: in Pappschachteln à 10 Stück / Emballage: dans boîtes de carton à 10 pièces / Embalaje: en cartones de 10 piezas

PILANA

328 B/772

DRILL MIREX FOR KNOTS.

BOHRER MIREX FÜR KNORREN.

MÈCHE MIREX POUR NOEUDS.

BARRENA MIREX PARA NUDOS DE MADERA.

⌀	inches	3/8"	19/32"	13/16"	1"	1 3/16"	1 3/8"	1 5/8"
	mm	10	15	20	25	30	35	40
weight	oz	7	10	12 1/2	1	1/2	1/4	1/5
Gewicht / poids / peso	lbs, kgs	0,20	0,28	0,35	0,46	0,51	0,57	0,60

Packing: in cardboard-box per 10 pieces / Verpackung: in Pappschachteln à 10 Stück / Emballage: dans boîtes de carton à 10 pièces / Embalaje: en cartones de 10 piezas

PILANA

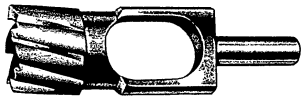
DRILL MIREX FOR STOPPERS.

BOHRER MIREX FÜR SPUNDE.

MÈCHE MIREX POUR BOUCHONS.

BARRENA MIREX PARA TAPONES.

329 B/771



PILANA

size			
Größe / grandeur / tamaño	inches	5/8" — 1"	
	mm	16—50	

Packing: in cardboard-box per 10 pieces / Verpackung: in Pappschachteln à 10 Stück / Emballage: dans boîtes de carton à 10 pièces / Embalaje: en cartones de 10 piezas

CENTRE BIT, ROUND, WITH SQUARE HEAD.

SPITZBOHRER, RUND, MIT VIERECKIGEM KOPF.

MÈCHE À TROIS POINTES RONDE, AVEC TÊTE CARRÉE.

BARRENA DE TRES PUNTAS, REDONDA, CON CABEZA CUADRADA.

330 B/707 K

size	inches	5/16"	3/8"	15/32"	9/16"	5/8"	11/16"	13/16"	7/8"	15/16"	1 1/32"	1 1/8"	1 3/16"	1 1/4"	1 5/16"	1 7/16"	1 1/2"	1 5/8"
Größe / grandeur / tamaño	mm	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
weight	oz	1	1	1	1 1/3	1 1/3	1 2/3	1 2/3	1 2/3	2	2	2 1/2	2 1/3	3	3	4	5	5
Gewicht / poids / peso	kgs	0,03	0,03	0,03	0,04	0,04	0,05	0,05	0,05	0,06	0,06	0,07	0,07	0,08	0,08	0,12	0,14	0,14

Packing: in cardboard-box per 10 pieces / Verpackung: in Pappschachteln à 10 Stück / Emballage: dans boîtes de carton à 10 pièces / embalaje: En cartones de 10 piezas

PILANA

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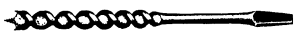
331 B/718 K

MACHINE MORTISE BIT WITH TWO CUTTERS with cylindrical shank.
LANGLOCHMASCHINENBOHRER, ZWEISCHNEIDIG, mit walzenförmigem Kolben.
MÈCHE À MORTAISER POUR MACHINES À DEUX TRANCHANTS, avec tête cylindrique.
BARRENA DE MORTAJAR PARA MAQUINAS DE DOS CORTES, con cabeza cilíndrica.
ditto — one cutter.
ditto — einschneidig.
ditto — un tranchant.
dtto — un corte.

Ø inches	1/4"	9/32"	5/16"	11/32"	3/8"	7/16"	15/32"	1/2"	9/16"	19/32"	5/8"	11/16"	13/16"	7/8"	15/16"	1 1/32"	1 1/8"	1 3/16"
mm	6	7	8	9	10	11	12	13	14	15	16	18	20	22	24	26	28	30
oz	3 1/4	3 1/4	3 1/2	3 3/4	3 3/4	4	4 1/2	4 1/2	5 1/3	5 1/3	6 1/2	7 1/2	9	10	11 2/3	14 2/3	1/1 2/3	1 1/2 1/3
kgs	0,09	0,09	0,10	0,11	0,11	0,12	0,13	0,13	0,15	0,15	0,18	0,21	0,25	0,28	0,33	0,48	0,50	0,52

Packing: in cardboard-box per 10 pieces / Verpackung: in Pappschachteln à 10 Stück
Emballage: dans boîtes de carton à 10 pièces / Embalaje: en cartones de 10 piezas

332 B/715 K



AUGER BIT DOUGLAS, DOUBLE LIPS.
SCHLANGENBOHRER DOUGLAS, ZWEISCHNEIDIG.
MÈCHE TORSE DOUGLAS, DOUBLE TRAÇOIRS.
BARRENA SALOMÓNICA DOUGLAS, CON CUCHILLOS DOBLES.

size inches:	1/4"	5/16"	3/8"	15/32"	9/16"	5/8"	11/16"	13/16"	7/8"	15/16"	1 1/32"	1 1/8"	1 3/16"
Größe grandeur tamaño mm	6	8	10	12	14	16	18	20	22	24	26	28	30
weight oz	2/3	1	1 1/3	1 2/3	1 2/3	2	2 1/2	3	3 1/4	3 3/4	6 1/2	8	9
Gewicht poids peso kgs	0,02	0,03	0,04	0,05	0,05	0,06	0,07	0,08	0,09	0,11	0,18	0,23	0,25

Packing: in cardboard-box per 10 pieces / Verpackung: in Pappschachteln à 10 Stück
Emballage: dans boîtes de carton à 10 pièces / Embalaje: en cartones de 10 piezas

Neodjíždějte z Brna,

dokud jste nenavštívili

výstavu

Československé hudební nástroje

Brno, ulice 25. února 10 (Zelný trh)

) 21 4296 59

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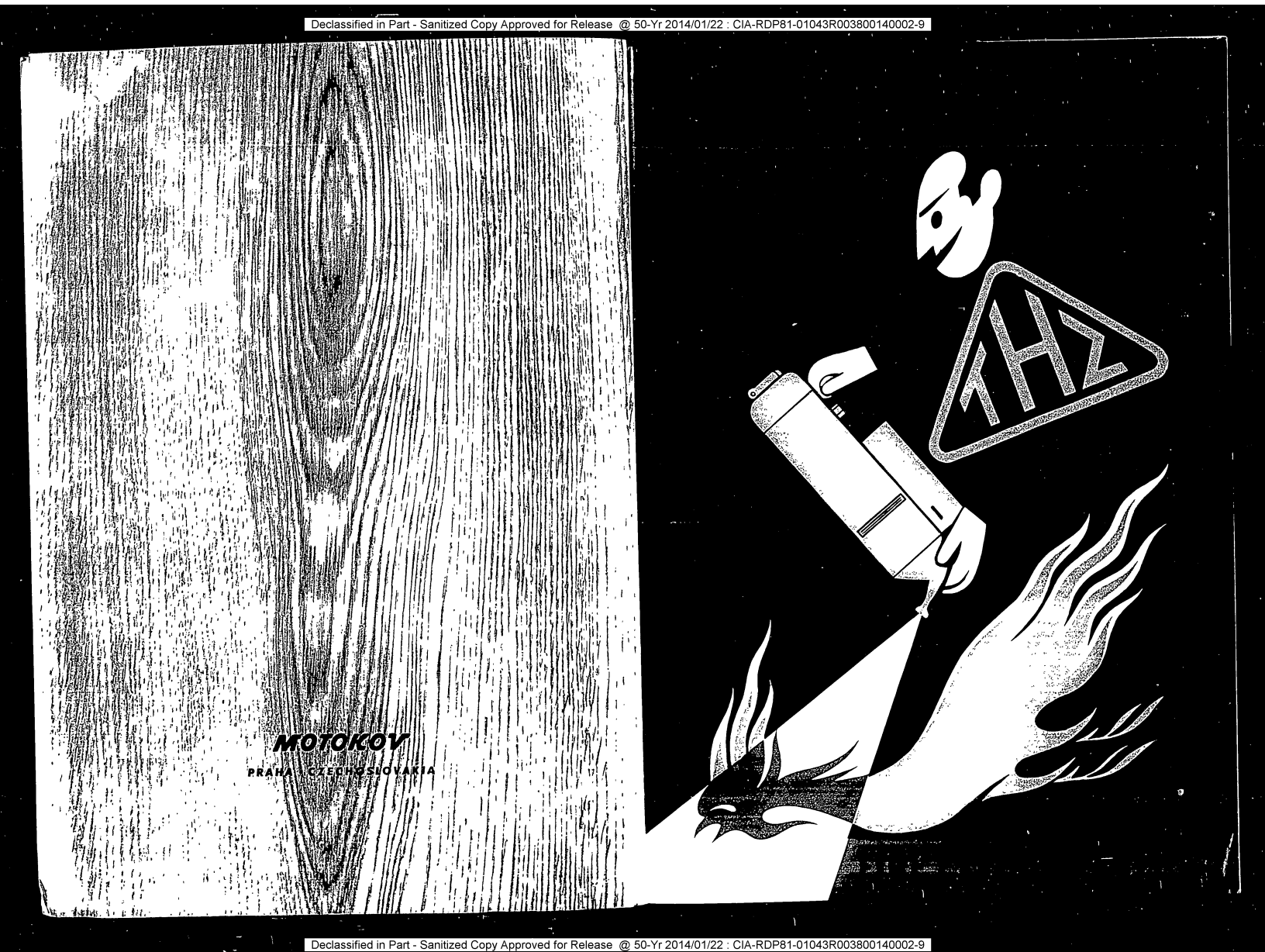

MOTOKOV

PRAHA - CZECHOSLOVAKIA

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In fighting fires various means are applied, both natural and artificial ones. The most common fire extinguishing means is water thrown into the flames by pressure pumps. Artificial fire extinguishing means are chemical substances, or admixtures added to water in order to increase the fire extinguishing effect. There are powder types, foam types, snow types, carbontetrachloride types, etc. of fire extinguishing means. The effect of the chemical substances or admixtures is exerted both by evolving gases in the fire which extinguish the combustion and by covering the burning object, after evaporation, by a compact film preventing the access of air.

Our assortment of fire fighting equipment contains perfect fire engines from the smallest to the largest sizes and fire extinguishers of all kinds.

MOTOKOV

PRAHA - CZECHOSLOVAKIA

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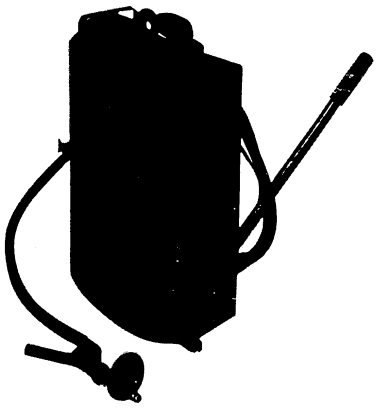
THE PORTABLE HAND OPERATED FIRE ENGINE • TYPE SZ 20



A reliable and efficient fire extinguisher for fighting fires in their beginnings. It is especially advantageous for safety precautions in houses and small workshops. It may also be used in forest fires by engaging large numbers of the sefire engines. It is also suitable for disinfecting and decontamination of areas striken by infection.

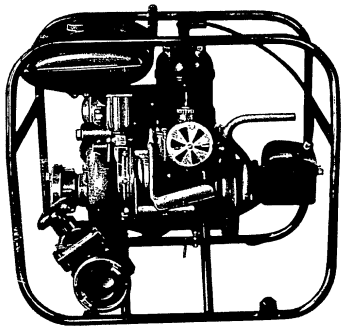
The portable hand operated fire engine consists of a tank and pumping equipment with a control device. The rubber hose 1.5 m long is provided with a combined jet pipe for both direct stream and spray.

The control device permits action both with the tank suspended on the back, or deposited on the ground.

THE DATA AND OUTPUT OF THE PORTABLE HAND OPERATED FIRE ENGINE:

Tank capacity	20 lit.
Maximum operational pressure	7 atm. g.
Direct stream range	10 m
Spray range	4 m
Pump output	10 lit per min.
Power required for obtaining the pressure of 7 atm. g.	14 kgs
Weight of hand operated fire engine when full	31 kgs
Weight of hand operated fire engine when empty	11 kgs

PORTABLE MOTOR FIRE ENGINE • TYPE PS 3



This fire engine is the smallest standard type of the motor fire engine produced in Czechoslovak factories. It is intended for use in places where a larger machine could not be used, for fighting smaller fires, or in places inaccessible for a mobile motor fire engine such as mountain cabins, foundries etc. Therefore, the fire engine is arranged in such a way that it may be carried both in the hands or on the back, including accessories.

The engine is of a one-cylinder, two-stroke type, cooled by water delivered by the pump, and forms with the pump an entity. The ignition is of the electromagnetic type. The fuel tank is sufficient for 2 hours of uninterrupted operation at the fire engine rated output.

The pump is provided with a vacuum pump for priming; should the vacuum pump fail the pump could be primed through the branch. Both the pump and the engine cooling is easily drained by opening the drain cock.

The fire engine is coated with a base paint as a protection against corrosion and also provided with a covering coating of green paint and the exhaust with an aluminium one. The lubricated spots are painted red, the drain cocks blue.

Before leaving the factory every fire engine is thoroughly tested and inspected for tightness of the pump, rated output and the highest permissible pressure in the pump. A certificate containing the results of the test is handed over to the customer.

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DATA OF THE MOTOR FIRE ENGINE TYPE PS 3

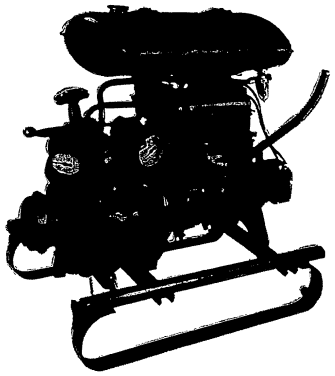
Rated water flow*)	lit./min.	300	180	150
at the delivery head	m	40	60	40
and suction head	m	1,5		4
Maximum permitted pump pressure	m water column	100		
Lowest engine output	HP	3.6		
Number of suction branches 52		1		
Number of delivery branches 52		1		
Approximate weight of the fire engine including accessories	kgs	35 + 90		
Type of fire engine		PS 3		

*) The limiting tolerances of the values given in the table are ± 5%.

WITH THE FIRE ENGINE THE FOLLOWING ACCESSORIES ARE DELIVERED.

Item	Name of part		ČSN standard	Number of pieces
1	Suction accessories	Suction strainer 52	38 9401	1
2		Suction hose 52×1.6	38 9404	3
3	Delivery accessories	Screw coupling spanner	38 9450	2
4		Hose 52×20	38 9452	6
5		Transition piece 75/52	38 9482	1
6		Jet pipe 52	38 9486	1
7	Auxiliary accessories	Suction hose packing 52	38 9414	2
8		Hose packing 52	38 9459	4
9		Hose packing 75		1
10		Box 85		1
11		Rope bracket	39 9559	1
12		Valve rope		1
13		Tarpaulin pail		1
14		Hose sleeve 52	38 9575	2
15		Hand operated searchlight		1
16	The engine and pump accessories	Double ended open spanner 9×10	23 0610	1
17		Double ended open spanner 11×12	23 0610	1
18		Double ended open spanner 14×17	23 0610	1
19		Magneto spanner		1
20		Sparking plug spanner (21)		1
21		Sparking plug gauge		1
22		Sparking plug brush		1
23		Sparking plug 14	30 4143	1
24		Screwdriver		1
25		Combination pliers	23 0380	1
26		Cylinder head gasket		1
27		Piston ring		1
28		Cleaning wire	38 9621	1
29		Portable fuel tank 20 lit.	16 2803	1
30		Portable oil tank 1 lit.		1
31		Funnel (with wire gauze)		1
32		Oil can 100		1
33		Box 85 with lubricating grease 3		1
34	Technical documents	The pump and engine diagram		1
35		Technical description of the fire engine and service instructions		1
36		Technical description of the carburetter		1
37		List of spare parts of the fire engine		1
38		List of accessories		1

THE PORTABLE MOTOR FIRE ENGINE • TYPE PS 8



The best proved type for factory fire squads and fire brigades in smaller communities. It is adjusted for being carried to inaccessible spots and can be, therefore, placed as near as possible to the source of water. Because of the great output it can replace even heavier two-wheel trailer fire engines. It has a two-cylinder, two-stroke engine, cooled by water delivered by the pump. The ignition is of the electro-magnetic type. The engine is started by a hand lever. The fuel tank capacity is sufficient for 2 hours of uninterrupted operation at the fire engine rated output.

The pump is of the two-stage type and forms with the engine an inseparable unit mounted on a stretcher with extensible handles for carrying the fire engine. In order to control its output the pump is equipped with a pressure gauge and a vacuum pressure gauge. The pump priming is facilitated by a gas vacuum pump and will not take longer than 1 minute, at the suction height of 7.5 m and the suction piping length of 10 m. Both the pump and the engine cooling are easily drained by opening the draining cock.

The fire engine is coated with the base paint against corrosion and then provided with a covering coating of green paint and the exhaust with aluminium. The lubricating spots are painted red and the draining cocks blue.

Before leaving the factory every fire engine is thoroughly tested and inspected for tightness of the pump, rated output and the maximum permissible pump pressure. The certificate with results obtained during the tests is handed over to the customer.

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TECHNICAL DATA OF THE MOTOR FIRE ENGINE, TYPE PS 8:

Rated water flow*)	lit./min.	800	480	400
at the delivery head	m	80	120	80
and suction head	m	1.5		7.5
Maximum permissible pump pressure	m water column	160		
Lowest vacuum attained in 1 minute	m water column	8		
Permitted drop of vacuum in 1 minute	m water column	1		
Lowest engine output	HP	30		
Number of suction branches 110		1		
Number of delivery branches 75		2		
Approximate weight of the fire engine including accessories	kgs	180+30		
Fire engine type		PS 8		

*) The limiting tolerances of the values given in the table are ± 5 %.

WITH THE FIRE ENGINE THE FOLLOWING ACCESSORIES ARE DELIVERED:

Item	Name of part	ČSN standard	Number of pieces
1	Carrying strap		2
2	Rubber mallet		1
3			
4	Sparking plug spanner (21		1
5	Sparking plug gauge		1
6	Sparking plug brush		1
7	Sparking plug 14	30 4143	2
8	Cylinder head gasket		1
9	Piston ring		2
10	Float		1
11	Cleaning wire	38 9621	1
12	Outlet hose 3 m		1
13	Exhaust pipe	38 9623	1
14	Mixing can		1
15	Portable fuel tank 20 lit.	16 2803	1
16	Portable oil tank 1 lit.		1
17	Funnel with wire gauze		1
18	Oil can 100	23 1425	1
19	Oil can 200	23 1420	1
20	Box 85 with lubricating grease 3		1
21	The pump and engine diagram		1
22	Technical description of the fire engine and service instructions		1
23	Technical description of the carburetter		1
24	List of spare parts of the fire engine		1
25	List of the fire engine accessories		1

THE PORTABLE MOTOR FIRE ENGINE • TYPE PS 8

WITH COMPLETE EQUIPMENT

The fire engine type PS 8 with complete equipment, ready for action.

It is placed in the fire brigade truck, or in a trailer with a hitching eye behind the trailing car. Approximate weight of the fire engine with complete equipment and engine accessories is 650 kgs. Technical description as for PS 8.

WITH THE FIRE ENGINE THE FOLLOWING FIRE FIGHTING ACCESSORIES ARE DELIVERED:

Item	Name of part		ČSN standard	Number of pieces
1	Carbontetrachloride fire extinguisher 1		38 9140	1
2	Hand operated fire pump 10			1
3	Suction accessories	Suction strainer 110	38 9403	1
4		Suction hose 110×1.6	38 9406	6
5		Collector 110	38 9426	1
6		Transition piece 110/75	38 9427	1
7		Ejector	38 9428	1
8	Delivery accessories	Fire-plug extension	38 9441	1
9		Hydrant key	30 9442	1
10		Fire-plug key	39 9444	1
11	Delivery accessories	Screw coupling spanner	38 9450	4
12		Hose 52×20		6
13		Hose 75×5	38 9452	2
14		Hose 75×20		10
15		Distributor	38 9481	1
16		Transition piece 75/52	38 9482	3
17		Jet pipe 75	38 9485	1
18		Jet pipe 52	38 9486	2
19		Jet pipe, screen type 52	38 9490	1
20		Tank with foaming agent	38 9520	2
21		Suction pipe of the admixer 25	38 9522	1
22		Admixer 5		1
23		Foam producing jet pipe 2		1
24	Auxiliary accessories	Suction hose packing 104		4
25		Suction hose packing 110	38 9415	2
26		Hose packing 25	38 9459	2
27		Hose packing 52	38 9459	4
28		Hose packing 75	38 9459	4
29		Box 135		1
30		Rope bracket	38 9559	2
31		Bracing rope		1
32		Valve rope		1
33		Rescue rope		3
34		Hose binding rope		6
35		Tarpaulin pail		1
36		Rescue rope sack		3
37		Sack		2
38		Hose coupling 52	38 9575	2
39		Hose coupling 75	38 9575	4
40		Flat commy bar	38 9576	1
41		Fireman's axe	22 5125	1
42		Field spade		1
43		Hand operated searchlight		2
44	The pump and engine accessories	Open spanner 41	23 0625	1
45		Screw-spanner	23 0777	1
46		Open spanner 9/10	23 0610	1
47		Open spanner 11/12	23 0610	1
48		Open spanner 14/17	23 0610	1
49		Open spanner 19/22	23 0610	1
50		Open spanner 24/27		1
51		Screwdriver		1
52		Pliers for pipes	23 0380	1
53		Combination pliers		
54	Technical documents	Technical description of the foaming equipment and its service instructions		1
55		List of accessories		1

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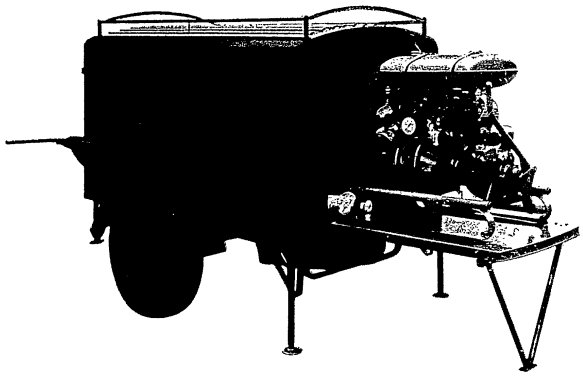
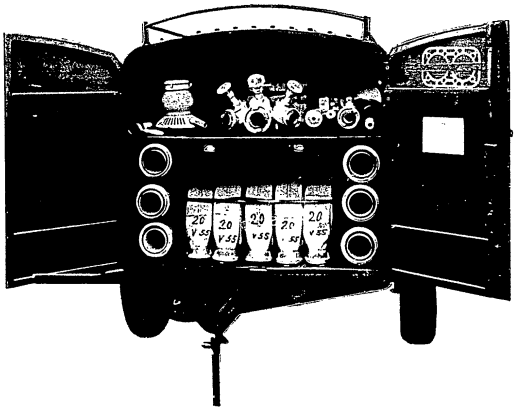
THE TRAILER TYPE MOTOR FIRE ENGINE • TYPE PPS 8/L

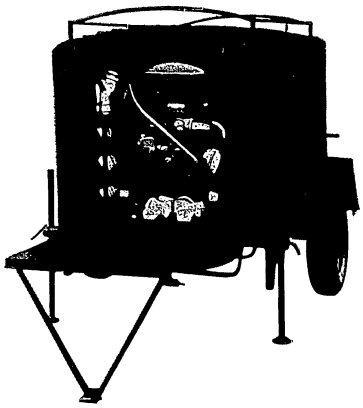


To facilitate transport the motor fire engine type PS 8 including complete accessories, is set in a trailer, provided with an eye for hitching to the trailing vehicle.

The approximate weight of the completely equipped trailer is 900 kgs. The technical description is analogous as for type PS 8.

The trailer type motor fire engine is delivered with the following accessories (with exception of accessories of the fire engine, type ČSN 38 9312 and the undercarriage, type ČSN 38 9326):





Item	Name of part		ČSN standard	Number of pieces
1	Carbontetrachloride fire extinguisher 1		38 9140	1
2	Portable motor fire engine 8		38 9312	1
3	Trailer 8/L		38 9326	1
4	Suction accessories	Suction strainer 110	38 9403	1
5		Suction hose 110 × 1.6	38 9406	6
6		Collector	38 9426	1
7		Transition piece 110/75	38 9427	1
8		Ejector	38 9428	1
9	Delivery accessories	Fire plug extension	38 9441	1
10		Hydrant key	38 9442	1
11		Fire-plug key	38 9444	1
12		Screw coupling spanner	38 9450	4
13		Hose 52 × 20	38 9452	4
14		Hose 75 × 5	38 9452	2
15		Hose 75 × 20	38 9452	5

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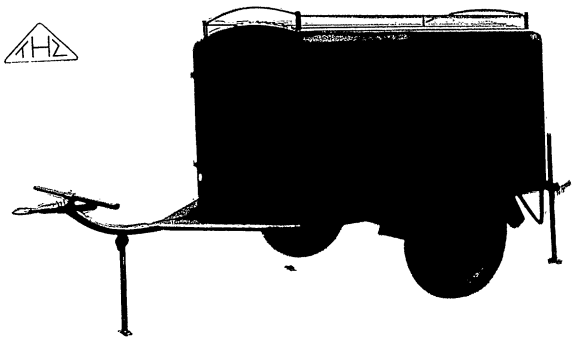
Item		Name of part	ČSN standard	Number of pieces
16		Distributor	38 9481	1
17		Transition piece 75/52	38 9482	2
18		Jet pipe 75	38 9485	1
19		Jet pipe 52	38 9486	2
20		Jet pipe, screen type 52	38 9490-	1
21		Suction hose packing 104	38 9415	4
22		Suction hose packing 110	38 9415	2
23		Hose packing 52	38 9459	4
24		Hose packing 75	38 9459	4
25		Box 135		1
26		Rope bracket	38 9559	2
27	Auxiliary	Bracing rope		1
28	accessories	Valve rope		1
29		Rescue rope		1
30		Hose binding rope		6
31		Tarpaulin pail		1
32		Rescue rope sack		1
33		Sack		2
34		Hose coupling 52	38 9575	2
35		Hose coupling 75	38 9575	4
36		Flat tommy bar	38 9576	1
37	Auxiliary	Fireman's axe	22 5125	1
38	accessories	Field spade		1
39		Hand operated searchlight		1
40		Open spanner 41	23 0625	1
41		Screw spanner	23 0777	1
42		Open spanner 9/10	23 0610	1
43	Pump and	Open spanner 11/12	23 0610	1
44	engine	Open spanner 14/17	23 0610	1
45	accessories	Open spanner 19/22	23 0610	1
46		Open spanner 24/27	23 0610	1
47		Screw driver		1
48		Pliers for pipes		1
49		Combination pliers	23 0380	1
50	Technical documents	List of accessories		1

TRAILER FOR THE PORTABLE FIRE ENGINE



The trailer is intended for the transport of motor fire engines with complete accessories.

The undercarriage is of frame type, all of metal construction and well sprung for cross country driving. The wheels are tyre shod, the tyre size being 6.00 × 16. On the undercarriage rear part there are two collapsible legs, for the stabilizing of the trailer. The undercarriage shaft has an eye for hitching the trailer to the trailing vehicle.

The all metal body is adapted inside to receive all the accessories, according to fire fighting regulations.

The weight approximate is 450 kgs.

The trailer is coated with a base paint against corrosion and provided with a covering coating of green paint.

WITH THE TRAILER THE FOLLOWING ACCESSORIES ARE DELIVERED:

Item	Name of part	ČSN standard	Number of pieces
1	Spare wheel (complete)		1
2	Wheel brace		1
3	Hub nut spanner		1
4	Jack with handle		1
5	Tyre pump		1
6	Tyre lever		2
7	List of undercarriage accessories		1

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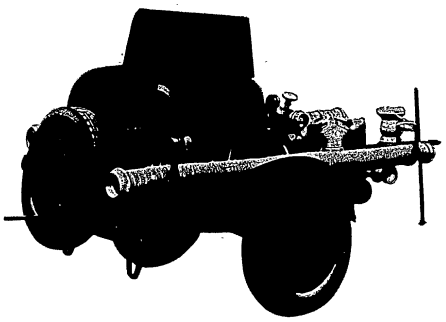
TWO-WHEEL MOTOR FIRE ENGINE • TYPE DS 16



It is a well proved type of a highly efficient motor fire engine for big fire brigades when the use of a truck mounted fire engine is out of question, as it would be impossible to get to the source of water. Due to its high mobility and output it is successfully applied by fire brigades in mountainous country, where the output of the portable motor engine would not be sufficient and could not deliver water to the higher situated locations.

The engine is of a four-cylinder, four-stroke design, cooled by water delivered by the pump. The ignition is of the electro-magnetic type and the starting is effectuated by a hand operated cranck. The fuel tank capacity is sufficient for 2 hours of uninterrupted operation at the fire engine rated output.

The pump is of a three-stage design with the jacket warmed by exhaust gases from the engine; it is coupled to the engine by a fixed coupling. To enable the control of its output the pump is provided with a pressure gauge and a vacuum pressure gauge. The priming of the pump is carried out by a rotary vacuum pump and does not take more than 1 minute at the suction head of 7.5 m. The pump and the engine cooling jacket are easily drained by opening the draining cock.

The undercarriage is of frame type, all metal construction and the suction accessories as well as the accessories of the undercarriage, pump and engine are reliably stowed on it. The wheels are tyre shod, with tyres size 6.00×16. The undercarriage shaft is provided with a leg for stabilizing the fire engine during operation and an eye for hitching to the trailing vehicle. The fire engine is provided with a base coating against corrosion and with a covering coating of green paint. The lubricated spots are painted red, the draining cocks blue. Before leaving the factory every fire engine is thoroughly tested and inspected for tightness of the pump, rated output and the maximum permissible pressure in the pump. The certificate containing the results obtained during tests, will be handed over to the customer.

TECHNICAL DATA OF THE FIRE ENGINE, TYPE DS 16:

Rated waterflow*)	lit./min.	1600	960	800
at the delivery head	m	80	120	80
and suction head	m	1.5		7.5
Maximum permitted pump pressure	m water column	160		
Maximum vacuum attained in 1 minute	m water column	8		
Permissible vacuum drop in 1 minute	m water column	1		
Maximum engine output	HP	50		
Number of suction branches 110		1		
Number of delivery branches 75		2		
Maximum weight of the fire engine with transported accessories		900		
Maximum weight of the rest of the accessories	kgs	500		
Fire engine type		DS 16		

*) The limiting tolerances of values given in the table are ± 5%.

WITH THE FIRE ENGINE THE FOLLOWING ACCESSORIES ARE DELIVERED:

Item	Name of part		ČSN standard	Number of pieces
1*)		Carbontetrachloride fire extinguisher 1	38 9140	1
2		Hand operated pail fire pump 10	38 9302	1
3*)	Suction accessories	Suction strainer 110	38 9403	1
4*)		Suction hose 110×2.5	38 9406	4
5*)		Collector 110	38 9426	1
6*)		Transition piece 110/75	38 9427	1
7*)		Ejector	38 9428	1
8	Delivery accessories	Fire plug extension	38 9441	1
9		Hydrant key	38 9442	1
10		Fire plug key	38 9444	1
11		Screw coupling spanner	38 9450	6
12		Hose 52×20		10
13		Hose 75×5	38 9452	2
14		Hose 75×20		15
15		Pressure relief valve	38 9480	1
16		Distributor	38 9481	2
17		Transition piece 75/52	38 9482	4
18		Jet pipe 75	38 9485	2
19		Jet pipe 52	38 9486	3
20		Screen type jet pipe 52	38 9490	1
21		Tank with foaming agent	38 9520	2
22		Suction hose of the admixer 25	38 9522	1
23		Admixer 5	38 9524	1
24		Foam producing jet pipe 2	38 9526	1
25	Auxiliary accessories	Suction hose packing 104	38 9415	4
26		Suction hose packing 110		2
27		Hose packing 25		2
28		Hose packing 52	38 9459	4
29		Hose packing 75		4

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Item	Name of part	Ordnance standard	Number of pieces
30	Auxiliary accessories	Box 135	1
31		Rope bracket	2
32		Bracing rope	1
33		Valve rope	1
34		Rescue rope	3
35		Hose binding rope	6
36		Tarpaulin pail	2
37		Rescue rope sack	3
38		Sack	2
39		Hose coupling 52	4
40		Hose coupling 75	6
41		Flat tommy bar	1
42		Fireman's axe	1
43		Field spade	1
44		Hand operated searchlight	2
45	Pump and engine accessories	Rubber mallet	1
46		Open spanner 41	1
47		Screw-spanner	1
48*)		Open spanners, double-ended 9/10, 11/12, 14/17, 19/22, 24/27	1
49*)		Magneto spanner	1
50*)		Sparking plug spanner	1
51*)		Sparking plug gauge	1
52*)		Sparking plug brush	1
53*)		Sparking plug	2
54*)		Screwdriver	1
55		Pliers for pipes	1
56*)		Combination pliers	1
57*)		Cylinder head gasket	1
58*)		Piston ring	4
59*)		Float	1
60*)		Cleaning wire	1
61		Outlet hose 3 m	1
62		Portable fuel tank	1
63		Portable oil tank	1
64		Funnel with gauze	1
65*)		Oil can 100	1
66*)		Oil can 200	1
67*)		Box 85 — with lubricating grease 3	1
68*)	Under-carriage accessories	Spare wheel (complete)	1
69*)		Wheel brace	1
70*)		Hub nut spanner	1
71*)		Jack with handle	1
72*)		Tyre pump with hose	1
73*)		Tyre lever	2
74	Technical documents	Pump and motor diagram	1
75		Technical description of the fire engine and instructions for its operation	1
76		Technical description of the foam producing device and instructions for its operation	1
77		Technical description of the carburetter	1
78		Fire engine spare parts list	1
79		List of accessories	1
80		List of accessories of the undercarriage	1

*) thus marked accessories are stowed on the undercarriage.

FIRE EXTINGUISHERS

Fire extinguishers are well proved and reliable fire fighting appliances for extinguishing breaking out fires if applied in time, if a suitable fire extinguisher used and the instructions strictly followed.

A suitably chosen fire extinguisher when applied in time and correctly, will prevent great damage.

For extinguishing large fires, mobile fire extinguishers of the foam and snow type with a large tank capacity are produced.

When choosing the type of fire extinguisher the likely combustibles have to be taken into consideration, since there does not yet exist a universal fire extinguisher for all types of fires and combustibles.

TABLE INDICATING THE SUITABILITY OF FIRE EXTINGUISHERS:

Burning combustibles	Capability of the fire extinguisher				
	water type	foam and foam-air type	snow type	powder type	carbontetrachloride type
Wood, Wood chips, Packing materials, Paper, Textiles, Fibre	excellent	good	limited	limited	bad
Paints, Solvents, Lacquers, Petrol, Benzol, Oils, Fats and greases, Waxes, Tar	bad	excellent	good	good	excellent
Electrical equipment	bad	bad	excellent	excellent	limited

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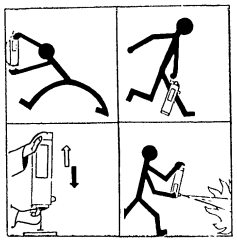
WATER TYPE FIRE EXTINGUISHER • TYPE V 10

It extinguishes fire of all substances extinguishable with water. The admixture disolved in the water filling increases the fire extinguishing effect of water to a great extent.



The fire extinguisher is actuated by striking the striker against a hard object. The striker will penetrate a cartridge inside the apparatus and the carbon dioxide produced by a chemical reaction, thus initiated, will force out the filling of the apparatus. A safety valve the diaphragm of which will break under pressure of 10 atm. g warrants the complete security of the apparatus.

The fire extinguishers are delivered with fillings ensuring antifreezing ability:

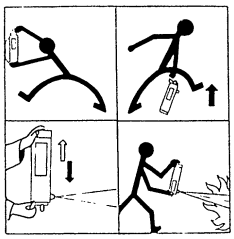
up to — 3° C	under the mark V 10 N
up to —15° C	under the mark V 10 M
up to —30° C	under the mark V 10 MM

TECHNICAL DATA AND OUTPUT OF THE FIRE EXTINGUISHER

Testing pressure	18 atm. g.
Time from the striking of the apparatus to the beginning of the spray	5 seconds
Minimum range of spray,	10 m
Period of operation	1 min.
Quantity of fire fighting substance applied	10 lit.
Weight of the filled fire extinguisher	19 kgs.

FOAM - AIR TYPE FIRE EXTINGUISHER • TYPE VP 10

A reliable fire extinguisher of liquid combustibles by means of pneumatic foam. The fire extinguishing effect of this foam is excellent. The foamhas good heat resistant qualities and spreads quickly



on the burning surface. The great adhesiveness of the foam prevents the restartring of the fire. The foam spray can be interrupted at any moment by closing the valve.

The fire extinguisher is brought into operation by opening the valve of the bottle containing compressed air. The escaping air forces the fire extinguishing means from the vessel to the foam chamber and from there already in form of a foam by the spraying nozzle from the apparatus. The safety valve, the diaphragm of which will break under the pressure of 10 atm. g. warrants complete security of the apparatus.

TECHNICAL DATA AND OUTPUT OF THE FIRE EXTINGUISHER

Testing pressure	18 atm. g.
Time of operation	1 min.
Minimum range of spray	6 m
Quantity of filling	10 lit.
Quantity of foam	75 lit.
Warranted antifreezing resistance to temperature of	—3 °C
Weight of the filled fire extinguisher	20 kgs

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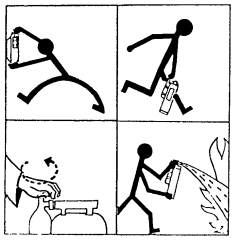
FOAM TYPE FIRE EXTINGUISHER • TYPE P 10

It is advantageously applied for extinguishing burning liquid combustibles as well as other fires; especially in cases when water could cause considerable damage, the foam type fire extinguisher



will operate quickly and reliably. The foam resists to great heat and remains liquid at an exceptionally good consistency. It spreads very quickly on the surface of the burning liquids. It also sticks to solid objects and covers everything by a completely harmless, thick layer of foam. That will prevent the access of oxygen and the fire will be extinguished.

The fire extinguisher is put in operation merely by being turned upside down which will cause the mixing of the acid with the alkaline contents of the fire extinguisher and the produced carbon dioxide foams up the fire extinguishing means and forces it through the spraying nozzle from the apparatus. The safety valve the diaphragm of which will break under pressure of 10 atm. g., warrants complete security of the fire extinguisher. The fire extinguishers are delivered with antifreezing filling:

up to — 3° C	under mark P 10 N
up to —15° C	under mark P 10 M

THE TECHNICAL DATA AND OUTPUT OF THE FIRE EXTINGUISHER

Testing pressure	18 atm. g.
Time interval from the turning up of the apparatus to the beginning of spraying	5 seconds
Period of operation	1 minute
Minimum range of spraying	6 m
Quantity of filling	10 lit.
Quantity of foam	50 lit.
Weight of the filled fire extinguisher	20 kgs

SNOW TYPE FIRE EXTINGUISHER • TYPE S

A reliable fire extinguisher for application to all kinds of combustibles. The carbon dioxide extinguishes the fire by deeply cooling the burning

materials and forming an incombustible coating. Mechanically it is completely neutral and leaves no traces on objects. It is especially suitable for extinguishing fires of electric equipment, even under high tension, due to its complete non-conductivity.

The jet of the fire extinguishing means may be interrupted at any moment by closing the valve.

The fire extinguisher is brought in operation by opening the bottle valve. The escaping carbon dioxide in the jet pipe partly turns due to expansion into a solid substance and is then forced off the jet pipe by the gaseous carbon dioxide.

THE FIRE EXTINGUISHERS ARE DELIVERED IN TWO SIZES:

Mark	S 1.5	S 6
Filling of the fire extinguishing means	kgs 1.5	6
Weight of the filled fire extinguisher	5.5	25

TECHNICAL DATA AND OUTPUT OF THE FIRE EXTINGUISHER:

Period of operation	35 sec.	50 sec.
Minimum range of spraying	1.5 m	2.5 m
Quantity of solid carbon dioxide produced	0.3 kgs	1.2 kgs
Warranted antifreezing resistance to the temperature of	—30 °C.	

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POWDER TYPE FIRE EXTINGUISHER • TYPE PR 6

The powder type fire extinguisher is advantageously applied to extinguishing burning liquid combustibles and wherever water might cause damage. It is especially suitable for application on electric equipment due to the non-conductivity of the powder fire extinguishing means. The fire extinguishing effect is produced by the powder enveloping the burning materials with an incombustible layer. The fire extinguishing spray may be interrupted at any moment by closing the valve.

The fire extinguisher is brought into operation by opening the valve of the steel bottle containing carbon dioxide, forcing the dispersed fire extinguishing powder means from the pressure tank through the spraying nozzle. A safety valve the diaphragm of which will break under pressure of 10 atm. g., warrants complete security of the fire extinguisher.

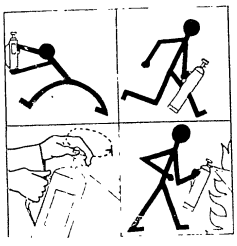
TECHNICAL DATA AND OUTPUT OF THE FIRE EXTINGUISHER.

Testing pressure	18 atm. g.
Minimum period of operation	15 seconds
Minimum range of spraying	3,5 m
Fire extinguishing means	6 kgs
Quantity of carbon dioxide in the bottle	0.32 to 0.35 kgs
Warranted antifreezing resistance to temperature	—30 °C
Weight of the filled fire extinguisher	12 kgs.

CARBONTETRACHLORIDE FIRE EXTINGUISHER • TYPE T

THZ

A well tried fire extinguisher for application both to liquid and solid combustibles. The carbontetrachloride leaves no traces on the materials, does not soil the mechanical parts and is, therefore, advantageously applied for extinguishing burning motor cars. Due to its non-conductivity, the carbontetrachloride is primarily an ideal fire extinguishing means of electric equipment, even under high tension. The carbon-



tetrachloride extinguishes the flames while the fire extinguishing means are decomposed in the fire to heavy gases preventing the access of air.

The fire extinguisher is brought into operation by opening a valve; the compressed air will force the fire extinguishing means through the spraying nozzle from the apparatus. The spraying may be interrupted at any moment by closing the valve.

THE FIRE EXTINGUISHERS ARE DELIVERED IN 3 SIZES.

Mark	T 1	T 2.5	T 6
Filling of the fire extinguishing means in lit.	1	2.5	6
Weight of the filled fire extinguisher in kgs	4	7.5	15

TECHNICAL DATA AND OUTPUT OF THE FIRE EXTINGUISHER

Testing pressure	12 atm. m. g.
Air overpressure	7.5—8 atm. g.
Minimum range of spraying	6 m
Warranted antifreezing resistance up to a temperature of	—30 °C.

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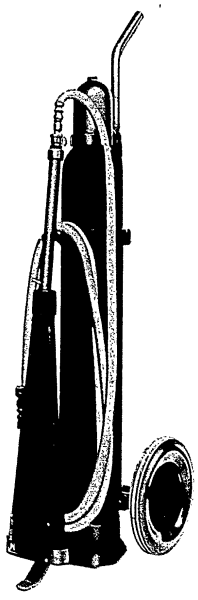
SNOW TYPE MOBILE FIRE EXTINGUISHER TYPE S 1×25



An efficient fire extinguisher for application on all types of combustibles, especially of electric equipment under high tension. The steel bottle with the liquified carbon dioxide is fixed on a two-wheel barrow with a pulling handle for movement by manpower. The barrow wheels are provided with rubber rims of a diameter of 355×60 mm. The releasing valve is fitted with an armoured hose, 6 m long, provided with a snow jet pipe made of an insulating, non-conductive material. The fire extinguishing spray may be interrupted at any moment by closing the valve.

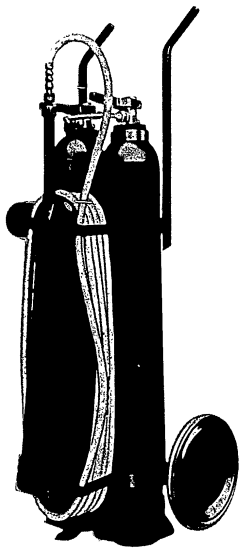
The fire extinguisher is brought into operation by opening the valve on the steel bottle. The escaping carbon dioxide in the jet pipe is turned due to expansion partly to a solid substance and is then forced off the jet pipe by the gaseous dioxide.

TECHNICAL DATA AND OUTPUT OF THE FIRE EXTINGUISHER

Filling of the fire extinguishing means	25 kgs
Period of operation	3 minutes
Minimum range of spraying,	3 m
Quantity of solid carbon dioxide produced	6.25 kgs
Warranted antifreezing resistance to temperature	—30 °C
Weight of the filled fire extinguisher	105 kgs.

SNOW TYPE MOBILE FIRE EXTINGUISHER TYPE S 2×25

A very efficient fire extinguisher to be applied to all combustibles, especially to electric equipment under high tension. The apparatus has 2 steel bottles containing the liquified carbon dioxide, fixed on a barrow with a handle bar. The wheels of the barrow are provided with rubber rims of a diameter of 355×60 mm. An armoured hose, 12 m long is fitted to the bottles provided with a snow type jet pipe made of an insulating non-conductive material. The spray of the fire extinguishing means may be interrupted at any moment by closing the valve. The fire extinguisher is brought into operation by opening the valve on one of the bottles. The escaping carbon dioxide in the jet pipe is turned due to expansion partly to a solid substance and is forced off the jet pipe by the gaseous dioxide. After exhausting the supply contained in one bottle, a second one is brought into action by opening its valve.



TECHNICAL DATA AND OUTPUT OF THE FIRE EXTINGUISHER.

Filling of the fire extinguishing means	50 kgs
Period of operation	6 minutes
Minimum range of spraying	3 m
Quantity of solid carbon dioxide produced	12.5 kgs
Warranted antifreezing resistance to temperature	—30 °C
Wight of the filled fire extinguisher	205 kgs

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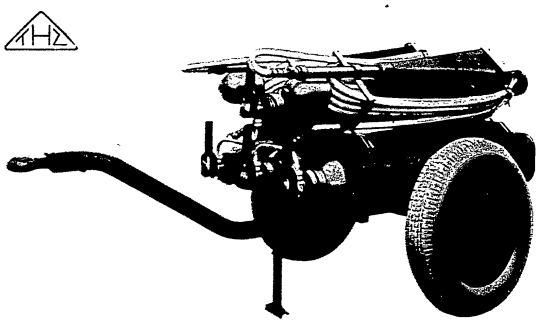
SNOW TYPE MOBILE FIRE EXTINGUISHER TYPE S 4×25

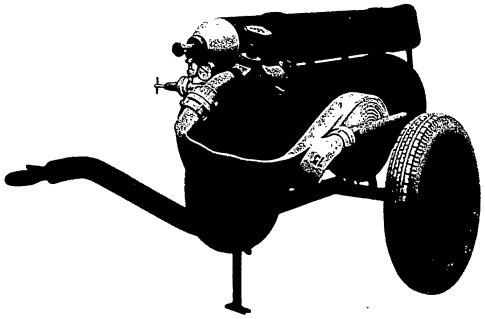


A highly efficient fire extinguisher with application to all combustibles, especially to eletric equipment under high tension. The fire extinguisher has 4 steel bottles containing the liquified carbon dioxide, fixed on the undercarriage. The undercarriage wheels are provided, with tyres size 5.00×16. The undercarriage shaft is provided with a folding leg and an eye for hitching behind the trailing vehicle. The bottles are fitted with 2 armoured hoses, 12 m long each. One armoured hose is connected with two bottles. The hoses are provided with snow type jet pipes made of an insulating non-conductive material. The fire extinguisher is brought into operation by opening the valve of one pair of the bottles or, when spraying is done in both directions, by opening the valve of the second pair. After exhausting of the contents of one bottle, the spraying is continued by opening the other one.

TECHNICAL DATA AND OUTPUT OF THE FIRE EXTINGUISHER

Filling of the fire extinguishing means	100 kgs
Period of operation	12 minutes
Minimum range of spraying,	3 m
Quantity of solid carbon dioxide produced	25 kgs
Warranted antifreezing resistance	—30 °C
Permitted speed when trailing	30 km per hour
Weigh of the filled fire extinguisher	515 kgs

FOAM TYPE MOBILE FIRE EXTINGUISHER • TYPE VP—200



A highly efficient fire extinguisher for application on liquid combustibles by using the pneumatic foam. The foam is highly refractory and remains liquid at an exceptionally good consistancy. It spreads very quickly on the burning liquid surface. It also sticks to solid objets and covers everything with an absolutely harmless, thick layer of foam, thus preventing the access of oxygen and extinguishing the fire. The extinguisher is independent of water connection and may be, therefore, used for any fire without losing time. Water required for the production of foam as well as the foaming agent are prepared in the extinguisher. On the tank for the fire extinguishing liquid is fixed a steel bottle containing compressed air, necessary for production and discharge of the foam. The fire extinguisher is provided with a regulating device for 10—30 times foam increase. A safety valve opened at the pressure of 10 atm. g. warrants complete security of the fire extinguisher.

The fire extinguisher is mounted on a two-whele undercarriage on tyres 5.00×16. The undercarriage shaft is provided with a folding leg and with an eye for hitching to a trailing vehicle.

The extinguisher is brought into operation by opening the valve of the steel bottle and the slide valve of the mixing chamber. The escaping air forces the fire extinguishing means from the tank into the mixing chamber and from there, alerady in the form, of foam into the jet pipe. The foam spray may be interrupted at any moment by closing the slide valve.

TECHNICAL DATA AND OUTPUT OF THE FIRE EXTINGUISHER:

Tank capacity	200 lit.
Minimum quantity of the produced foam	1600 lit.
Period of operation	3 minutes
Minimum range of spraying,	10 m
Warranted antifreezing resistance to temperature	— 30 °C
Permitted speed when trailing	30 km per hour
Weight of the filled fire extinguisher	550 kgs.

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MOTOKOV

As we are steadily improving the construction and design of our machines, the illustrations and specifications of this pamphlet are not binding.

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PRAHA

MOTOKOV, Czechoslovak Foreign Trade Corporation, has a very extensive export program. To its selling scope belong all the products of the motor and light engineering industry, in other words goods of the best reputation in the world.

The Czechoslovak industry is known on all the Continents, in Europe as well as Overseas. Czechoslovakia, a small country in respect of its area and number of inhabitants, ranks among the big powers due to the importance of its engineering industry. All the world knows and employs machines and products marked ŠKODA, JAWA-CZ, TATRA, PRAGA, ZETOR, FAVORIT, PORKERT, BARUM, ALBA etc., etc. Both, specialists and the general public appreciate their advanced design, perfect workmanship and absolute reliability in operation. Trade fairs visitors can then convince themselves of the qualities of Czechoslovak manufactured goods demonstrating successfully the great post-war development of the Czechoslovak industry.

Accordingly, MOTOKOV represents first and foremost all branches of the motor industry: motorcars, commercial vehicles, motorcycles, tractors, accessories and equipment. With the tractors range agricultural machines of all types, with the means of transport bicycles and cycle parts. Another branch of export is formed by machines, equipment, appliances and tools for workshops, tradesmen shops, large kitchens and households. Enamelware belongs yet to another category. Rubber and leather goods of predominantly technical character complete the program.

The fact that the extensive export business ranks MOTOKOV today with the leading export companies of the world, is not due to the qualities of the goods alone. Other factors make their contribution, above all commercial agents. The network of agencies is being continuously extended. Because of this it is possible to ascertain in full measure the wishes of the buying public, translate them in production and meet them in every detail. In this way production learns to know the requirements of markets and therefore customers are satisfied.

MOTOKOV is simply the representative of goods and modern, perfectly manufactured articles which owing to their quality and good service are winning a leading position and outstanding reputation on the world markets.

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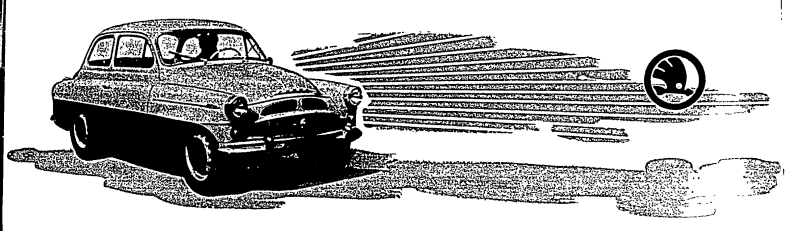
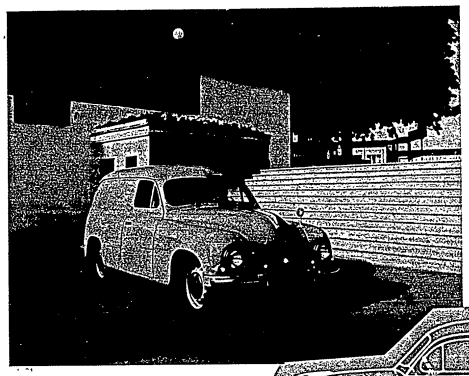
The Name Škoda Dominates

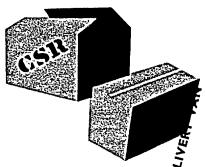
It means more than half a century of work on Czechoslovak motorcars, continuous improvements of design, coachwork, engines, suspension and all other details which make up a perfect car. It means tens of preceding successful models known over the world from the most difficult competitions and from perfect service given to motorists of all the continents. Consequently the two last members of this famous family, the ŠKODA 1201 and the ŠKODA 440 are such outstanding representatives of motorcars of modern times.

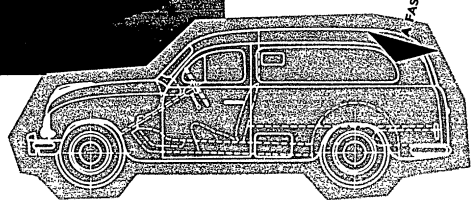
ŠKODA 1201 Superior to present, popular models of ŠKODA cars, it is a worthy representative of the famous tradition of its predecessors and from every point of view a perfect work of modern motorcar technique. Notwithstanding the so often proved and tested basic conception its improvements are truly substantial: increased power output, easier handling, better comfort. It is being manufactured also in utility execution, as station-wagon, delivery van or ambulance car with two berths.

ŠKODA 440 A car for drivers, who are fond of speed, lightning acceleration and the pleasure of magnificent riding. Graceful bodywork, comfortable interior with relatively small outer dimensions, excellent view in all directions, output 40 HP at a consumption of 40 m.p.g. — such are the typical features of this new model, received with enthusiasm on foreign markets.









FAST AND LIVELY DELIVER

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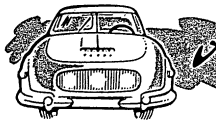
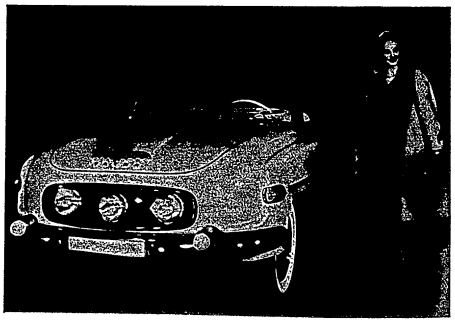


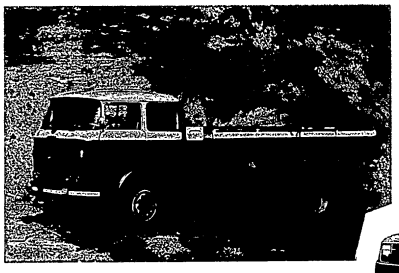
A New Car
OF FAMOUS TRADITION

603

Tatra



The TATRA 603 de luxe car is another proof of the splendid work of the TATRA Works. It is an air-cooled eight cylinder of 2245 c.c. engine capacity. It has an output of 100 HP at 5000 r.p.m. and is capable to carry six comfortably seated passengers at a speed of 100 m.p.h. Robust, graceful coachwork, first class equipment and economy complete its features.



Škoda 706 RTS

Six-cylinder Diesel, output 165 HP, with a tipping steel body which enables tipping to three sides. Carrying capacity 7 tons. Simple attendance and fuel consumption of 25 litres per 100 km result in a highly economical operation. It is best suited for transport under difficult operational conditions with minimum demands from the driver.

Czechoslovak Commercial Vehicles

FOR ECONOMIC TRANSPORT ON AND OFF ROAD

Reliable, of solid construction and durable vehicles. Of modern, very simple design, easy to handle, requiring minimum running costs. Therefore both engines and complete units are subjected to thorough tests before delivery. Their popularity all over the world pays for the extra effort.

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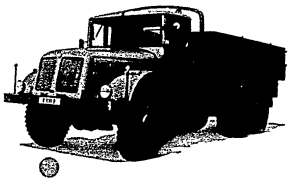


Tatra 111

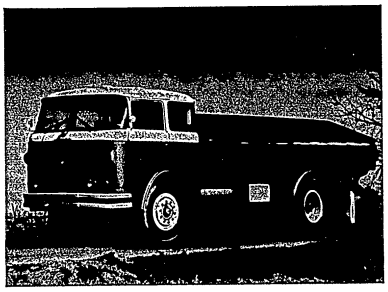
This mammoth among vehicles of 10 tons load capacity has a twelve cylinder air-cooled Diesel engine of 180 HP power output, a three-axle chassis with independent suspension of all wheels and auxiliary gearbox (altogether eight speeds).

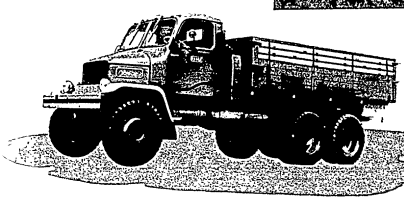
LHASA (TIBET)

TATRA

Skoda 706 RT

Six-cylinder Diesel power unit, with cargo platform of 7000 kg carrying capacity and power output of the engine 170 BHP.
It is appreciated for its service economy and realiability.
Robust chassis with efficient springing enables the transport of heavy cargoes at long distances.





Praga V 3 S

Air-cooled Diesel six cylinder engine of [illegible] HP for general use on road and in terrain, has 3 driven axles and an outstanding climbing [illegible]ility of up to 60%. Delivered as: truck, tipper in special execution, as tanker, refuse tr[illegible], etc.

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ZETOR TRACTORS THE IDEAL SERVANTS

Are designed and made so as to meet all requirements of modern agriculture. Born of the exacting demands of the existing owners, manufactured according to the latest production methods based on many years of experience. The result are ZETOR tractors, powerful assistants of modern agricultural workers, assistants that pay.

25 A

Universal plough and haulage tractor with high performance twin cylinder Diesel engine for medium and small farms.

25 K

Universal cultivation tractor with increased ground clearance under both axles for any kind of soil and climate.

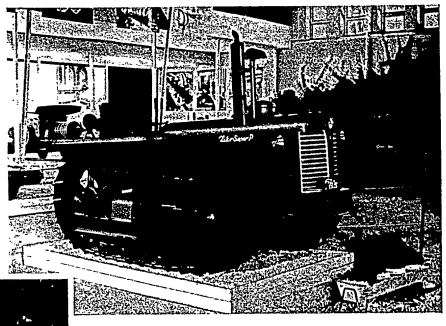
SUPER, WHEEL TRACTOR

Universal four-cylinder tractor for heavy field work, forestry, building, industry, etc.

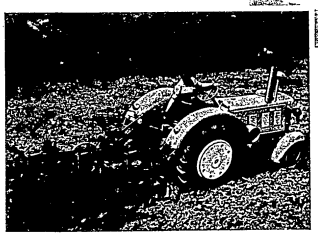
ZETOR SUPER, TRACK LAYING TRACTOR

Medium heavy track laying tractor for hard and difficult jobs in agriculture, forests, on building sites. Its tracks will easily master such obstacles which wheels can not overcome.

Zetor



TOKIO



FOR HIGHER YIELDS — QUALITY AGRICULTURAL IMPLEMENTS

The range is very wide. Tractor drawn and carried and animal drawn implements of all kinds, ploughs, seed drills, mowing machines, combine-harvesters, self-binders, presses, thrashing machines, chaff-cutters, blowers, sprayers, stamping-mills etc. are available.

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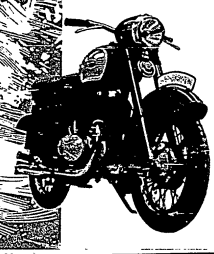
Czechoslovak Motorcycles

BY CONVINCING VICTORIES — ARE MAKING HISTORY

JAWA-ČZ two-strokes are found on the roads of all the continents, their elegant lines, high performance, reliability and economy are admired both by experts and the public. More than half a million of these machines manufactured since the War covered countless miles to the enthusiastic satisfaction of their owners. They prove again and again their high qualities in the most difficult international races and trials.

Each new model and practically every series marks improvements in design. The automatic declutching mechanism is a feature protected by patents all over the world. Another simplification is the single lever serving both for starting the engine and gear changing. The telescopic front fork and pivoted rear fork make riding a pleasure. Owing to their speed the machines are equipped with full width hub brakes, more efficient and reliable.



Delivered in engine capacities:

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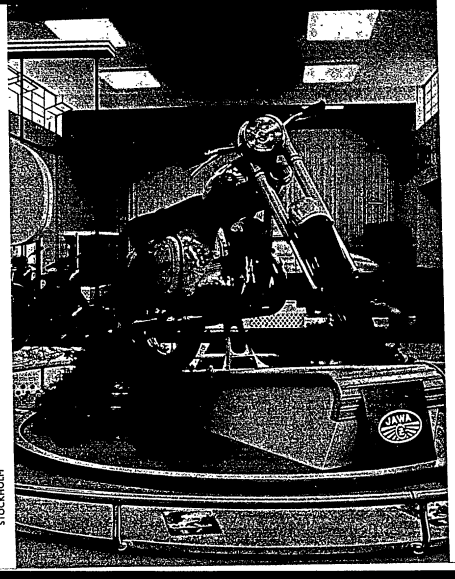
JAWA

JAWA-ČZ, THE WORLD'S BEST TWO-STROKE

STOCKHOLM



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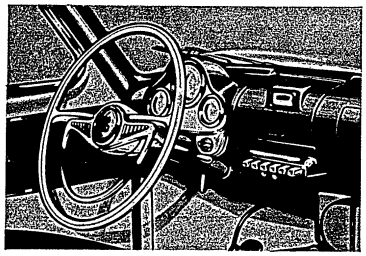
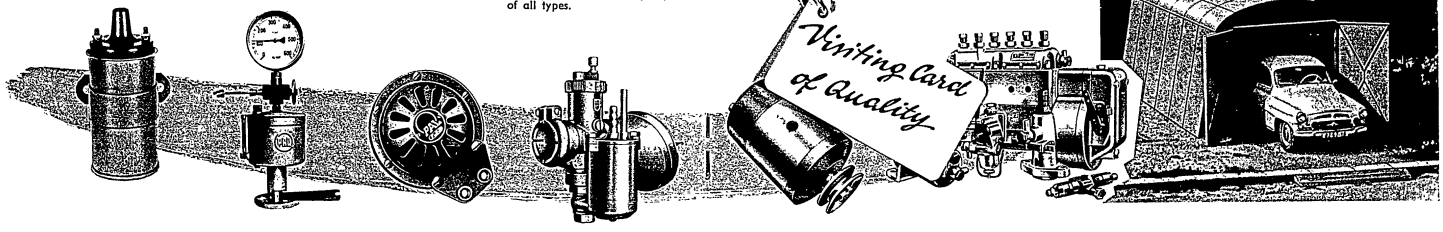


TROUBLE-FREE RUNNING WITH PAL ACCESSORIES AND EQUIPMENT

PAL

PAL electrical and mechanical accessories and equipment rank in respect of design and workmanship with the most outstanding world makes. They also make their contribution to the sporting successes of Czechoslovak motorcars and motorcycles.
Of the electrical appliances let us mention dynamos, electric starters, distributors, ignition coils, switches, windscreen wipers, direction indicators, headlamps, stoplights and others.
Of the mechanical: carburetters for motorcars and motorcycles, hydraulic and pneumatic brakes, shock absorbers, petrol pumps and dashboard instruments.
Diesel engine accessories consist of single and multiple cylinder injection pumps with injections nozzles, fuel filters and fuel feed pumps.
The following complete the lot:
universal testing apparatus for injection pumps, universal testing apparatus for electrical equipment, lifting jacks of all kinds, pump for inflammble liquids, bicycle and motorcycle chains, industrial chains of all types.



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Bicycle

THE SEVEN-LEAGUE BOOTS OF MAN

The age of motors does not hinder it. It remains always the most widespread means of transport in the world. For going to work, touring, racing and sporting purposes — for every occasion MOTOKOV offers a large choice of bicycles of popular names— STADION, VELAMOS, ESKA and FAVORIT. All have the same properties: beautiful appearance, easy running, life for many years.

Among the best known are:

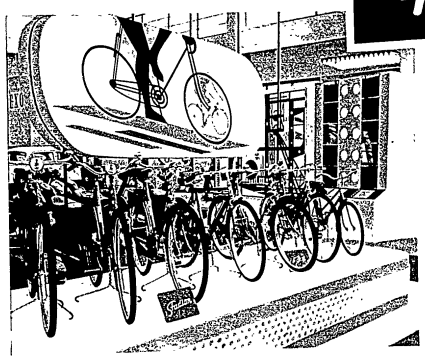
* *Roadster*
— for daily service on any road

Tourist
— the bicycle of sportsmen and tourists

Favorit
— a world class racing bicycle

Pionyr
— a solid bicycle for children

favorit



NEW YORK

BICYCLE PARTS UP TO THE STANDARD

Bicycle parts of the best reputation in demand even in countries with their own bicycle industry: coaster hubs, spokes, rims, chainwheels, cranks, pedals and particularly FAVORIT and VELO chains.

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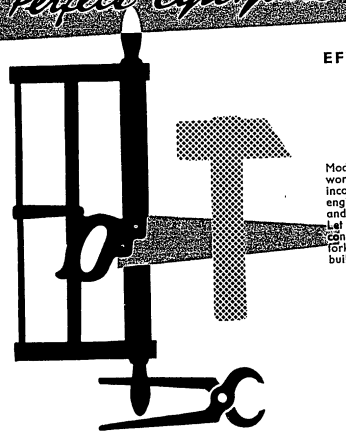
Perfect Equipment

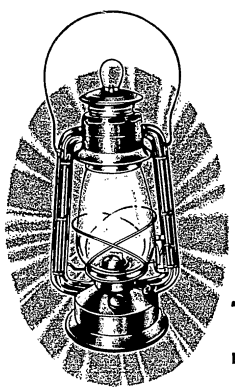


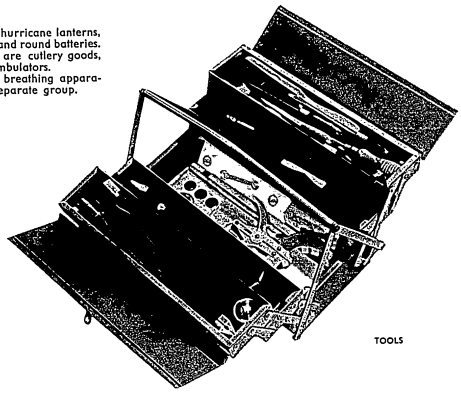
EFFICIENT WORKSHOP

Modern machines and good tools mean in workshops precision work that is fast and pays. The export program of MOTOKOV incorporates a number of more complicated and simpler light engineering products for this purpose, in demand everywhere and received with confidence.

Let us mention in the first place tools both for workshops and consumers, agricultural tools such as scythes, sickles, spades, forks, pickaxes, matchets, lubricating instruments, locks and building trade fittings.

Among the lamps there are miners' lamps, hurricane lanterns, oil lamps and electric torches including flat and round batteries. Among the remaining ironmongers' goods are cutlery goods, perforated sheet metal, hat hooks and perambulators. Woodworking machines, fire extinguishers, breathing apparatus, steel bottles and iron barrels form a separate group.





TOOLS

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LIGHTING EQUIPMENT OF ALL TYPES

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TO MAKE THE HOUSEWIFE'S WORK EASIER

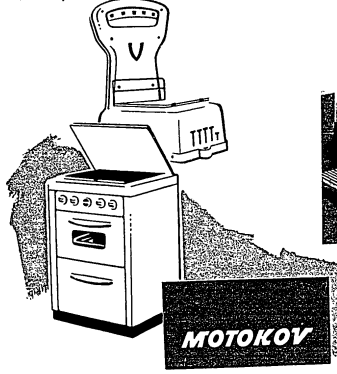
MOTOKOV sells all kinds of hand operated kitchen machines, all types of electric and gas appliances, cutlery and vacuum flasks.

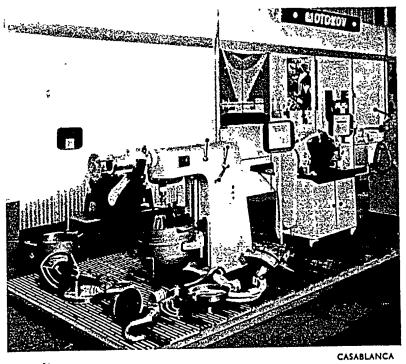
SHOP EQUIPMENT

For tradesmen, industrial enterprises, hotels, canteens, etc. Equipment for laundering and ironing, special machines for bakers, confectioners, butchers, refrigerating equipment of all sizes and special laboratory equipment for very low temperatures.

SCALES FOR EVERY PURPOSE

Production with modern equipment supplies scales for any kind of use. Besides table scales, fully automatic scales up to 11.000 lbs, automatic band scales for ore, road vehicle and railway weighing bridges, precision counting scales for small goods and giant weighing bridges for railway engine axle pressures. On demand scales of other than metric system will be supplied.





CASABLANCA

MOTOKOV PRAHA CZECHOSLOVAKIA

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Barum

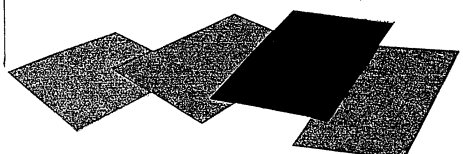
Leather and Rubber

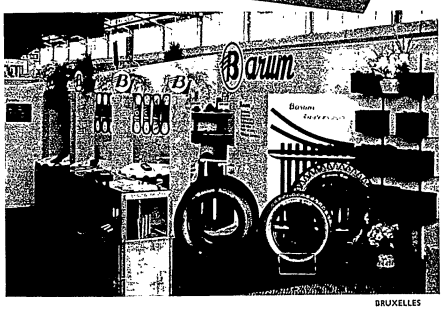
Small things are often decisive in the flow of production in the factory. Therefore demand for your machines such parts that owing to their qualities mean reliability. They bear the marks BARUM, TANEX, KARTIT, TEXTIT.

Inner tubes and tyre covers of the famous BARUM make manufactured in all standard dimensions with various tread for motorcars, commercial vehicles, motorcycles, bicycles, tractors and aeroplanes. They play an important part in the successes of the Czechoslovak motor industry.

SERVING THE TECHNIQUE

Among these parts are





BRUXELLES

Industrial V-belts for machine driving
Fan belts for driving motorcar fans
Rubber Transmission Belts for transport of material and goods in warehouses, building, mines etc.
Rubber-textile flat belts for machine and transmission driving
Plastic flat belts for machine driving (not for tropical climate)
Leather flat belts for machine driving
Leather cords round and oval for sewing machines and light transmissions
Kartit-hardened paper for electric insulation
Textit hardened paper with fabric for electric insulation and various technical accessories
Glasstextit-hardened paper with glass fabric
Battery containers for electric starters and motorcars and other electric drives
PVC separators for lead plate insulation in battery containers
Asbestos fabrics and products for insulation and fire resistant use
Small technical rubberware
Hoses: water, pressure, oxygen, radiator, food processing, petrol-resistant and special.

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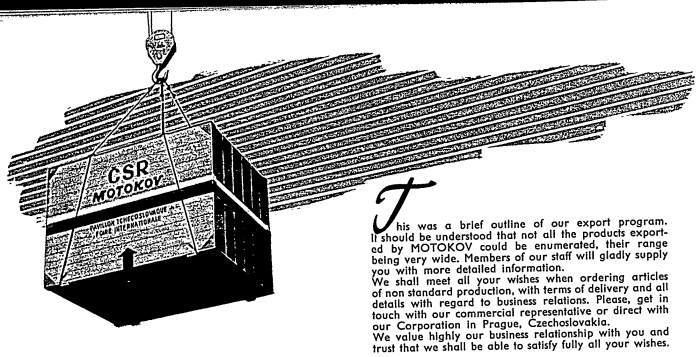

This was a brief outline of our export program. It should be understood that not all the products exported by MOTOKOV could be enumerated, their range being very wide. Members of our staff will gladly supply you with more detailed information.
We shall meet all your wishes when ordering articles of non standard production, with terms of delivery and all details with regard to business relations. Please, get in touch with our commercial representative or direct with our Corporation in Prague, Czechoslovakia.
We value highly our business relationship with you and trust that we shall be able to satisfy fully all your wishes.

MOTOKOV PRAHA · CZECHOSLOVAKIA

The data and pictures are not binding. Changes are reserved

PRAHA

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TECHNICAL DATA—JAWA-ČZ 350

Engine
Two stroke, two cylinder, bore 58 mm, stroke 65 mm, cylinder capacity 344 c.c., 16 B.H.P. at 4750 r.p.m., compression ratio 7 to 1

Engine lubrication
with petroil mixture at a rate of 25 to 1 (after running-in)

Clutch
Five plate with cork lining, running in oil bath, automatically controlled when changing gears, or by hand lever on L. H. side of handlebars when starting from standstill

Carburetter
PAL with wet air cleaner and strangler with effective air-intake

Exhaust silencers
Two exhaust pipes, with detachable silencers

Gearbox
Four speed, unit construction with engine, positive foot control on L.H side and automatic clutch

Electrical equipment
Coil type, dynamo 6 V/45 W, headlamp dia. 150 mm with double filament bulb 6 V 25/25 W, and 6 V—1,5 W, dip-switch on L.H side of handlebars. Combined tail and stop lamp. 6 V—14 Ah battery. Switch box flush fitted in fuel tank, containing an ammeter and indicating neutral gear position by lighting tell tale bulb

Fuel tank
Capacity 2.9 gallons (13 litres) with two position fuel tap fitted with filter Emergency fuel reserve for 20 miles (30 km)

Transmission
By totally enclosed primary chain 3/8×3/8 in., running in oil bath and by fully enclosed secondary chain 1/2×5/16 in in chaincase

Frame
Closed, of best quality square section welded tubes with pivoted rear fork

Suspension
Front—by telescopic fork with hydraulic dampers of new designe—maximum stroke 5 1 8 in. (130 mm)
Rear—by pivoted rear fork with hydraulic dampers—maximum stroke 3 15/16 in (100 mm)

Handlebars
One piece, adjustable width 26 3/8 in. (670 mm). Bowdens can be adjusted on the handlebars

Wheels
Wire type, tyre size 3.25×16 in., easily detachable

Dual seat
With foam rubber, easily detachable, theft proof

Footrests
Sports type, adjustable

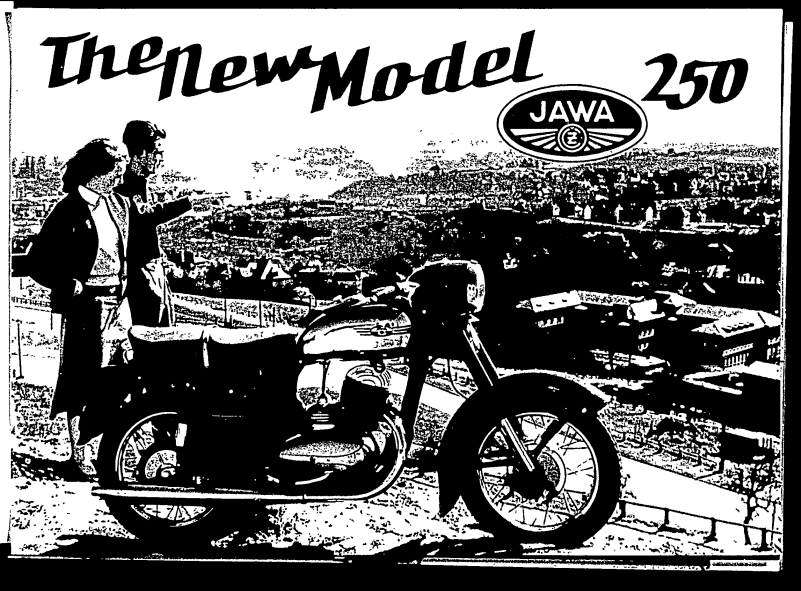
Other data

Weight	287 lbs (135 kg)
Carrying capacity	353 lbs (160 kg)
Maximum speed	71 m.p.h (115—120 km)
Maximum climbing capacity (fully loaded)	45 %
Fuel consumption	83 m.p.g. (3,25 litres per 100 km) at 30 m.p.h. (50 km p.h.)
Overall length	77 15/16 in. (1980 mm)
width	26 3/8 in. (670 mm)
height	40 3/8 in (1025 mm)

Modification of design and equipment may be effected without notice

MOTOKOV – PRAHA-CZECHOSLOVAKIA

21,57 — 60 — a



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TECHNICAL DATA – JAWA-ČZ 250

Engine
Two stroke, single cylinder, bore 65 mm, stroke 75 mm, cylinder capacity 248.5 c.c., 12 B. H. P. at 4750 r. p m., compression ratio 6.6 to 1

Engine lubrication
With petroil mixture at the rate of 25 to 1 (after running-in)

Clutch
Five plate with cork lining, running in oil bath, automatically controlled when changing gears, or by means of hand lever on L. H. side of handlebars when starting from standstill

Carburetter
PAL with wet air cleaner and strangler with effective air-intake

Exhaust silencers
Perfectly silence engine noise, two exhaust pipes with detachable silencers

Gearbox
Four speed, unit construction with engine, positive foot control on L. H. side and automatic clutch

Electrical equipment
Coil type, dynamo 6 V/45 W, headlamp dia 150 mm with double filament bulb 6 V/25/25 W 6 V—1 5 W, handlebar dipswitch. Combined tail and stop lamp 6 V—14 Ah battery. Switch box flush fitted in fuel tank, containing an ammeter and indicating neutral gear position by means of lighting tell-tale bulb

Fuel tank
Capacity 2.9 gallons (13 litres) with two position fuel tap fitted with filter. Emergency fuel reserve for 20 miles (30 km)

Transmission
By means of totally enclosed primary chain 3/8×3/8 in. running in oil bath and by means of fully enclosed secondary chain 1/2×5/16 in. in chaincase

Frame
Closed, of best quality square section welded tubes with pivoted rear fork

Suspension
Front—by means of telescopic fork with hydraulic dampers of new designe—maximum stroke 5 1/8 in (130 mm).
Rear—by means of pivoted rear fork with hydraulic dampers—maximum stroke 3 15/16 in. (100 mm)

Handlebars
One piece, adjustable, width 26 3/8 in (670 mm) Bowdens can be adjusted on the handlebars

Wheels
Wire type, tyre size 3.25×16 in., easily detachable

Dual seat
With foam rubber, easily detachable, theft proof

Footrests
Sports type, adjustable

Other data

Weight	276 lbs (125 kg)
Carrying capacity	353 lbs (160 kg)
Maximum speed	62 m.p.h. (106 km p.h.)
Maximum climbing ability (fully loaded)	40 %
Fuel consumption at 30 m.p.h. (50 km p.h.)	93 m.p.g. (3 litres per 100 km)
Overall length	177.95 in, (1980 mm)
width	26.38 in. (670 mm)
height	40.35 in. (1025 mm)

Modification of design and equipment may be effected without notice

MOTOKOV – PRAHA-CZECHOSLOVAKIA

20/57 — 60 — a

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ČZ 175 SCOOTER

TECHNICAL DATA:

Engine

Two-stroke, air-cooled	single cylinder
Bore and stroke	58 × 65 mm
Cylinder capacity	171,7 c.c.
Compression ratio	7 to 1
Power output	8 HP
Carburetter	JIKOV 2924 TŘ
Sparking plug	PAL 14/240
Engine lubrication by petrol mixture, at the rate of	25 to 1
Maximum speed	56 m.p.h. (90 km p.h.)
Maximum climbing ability (fully laden)	38 %

Transmission

Primary drive by 3/8 3 8 in. chain—54 links

Final drive by 1 2 5 16 in chain running in a chaincase serving at the same time as a pivoted arm for the floating suspension of the rear wheel.

Gear change by two-arm pedal left foot controlled

Gear ratios primary	40 21 teeth
final	47,16 teeth
Overall kickstarter ratio	3,04 to 1
Speedometer drive ratio	4,11 teeth

Chassis

Carrying frame is formed by the body made of electrically-spot and seam welded steel pressings Easy access for the servicing of all engine and gearbox parts. Under the seat is a luggage space of 1523 cub. in. (25 cub. dcm). Nearly all the body parts have been used to contribute to the solidity of the structure.

Wheels interchangeable with 3,25 × 12 in. tyres

The rims are two-piece and tyres can be fitted without the use of tools. The rims are fitted to the wheel center by means of six bolts.

Front wheel is supported by the two bottom links of the front fork with two rubber blocks and buffer serving as suspension elements.

Spare wheel this can be located within the body behind the front wheel and its cover serves as air collector for the cooling of the engine.

Brakes

Internal expanding	dia 140 × 35 mm
Braking distances from a steady speed of 25 m p h (40 km p h)	
Front wheel brake	100,75 ft. (30,8 m)
Rear wheel brake	100,75 ft. (30,8 m)
Both brakes applied	50,6 ft. (15,4 m)

Seat

Dual, foam rubber, lenght 27,5 in (700 mm)

Principal dimensions

Wheelbase	52,76 in. (1340 mm)
Overall length	75,6 in (1920 mm)
Overall width (over running boards)	21 65 in. (550 mm)
Overall width (over handlebars)	23,6 in (600 mm)
Total weight (including equipment)	269 lbs (122 kg)

MOTOKOV PRAHA-CZECHOSLOVAKIA

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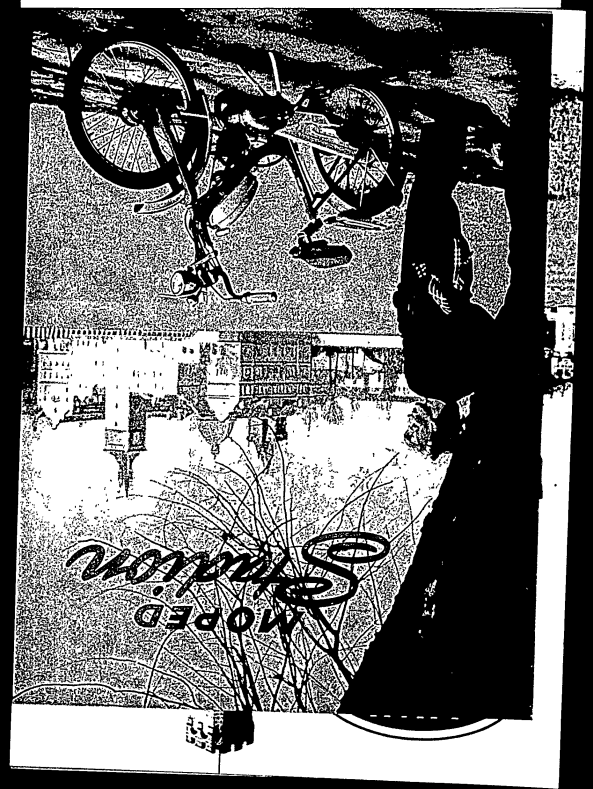

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MOPED STADION S 11

TECHNICAL DATA

Engine	Jawa 50 cc, model 552, single cylinder, air cooled two-stroke, swept volume 49,8 cc, output 1,5 HP SAE at 4.250 RPM.
Gearbox	Two forward gears, gear engaging mechanism governed with twist-grip on handlebars
Frame	Made of steel tubes
Fuel tank	Capacity 3 lit.
Front fork	Pressed, with short pivoted arms
Wheels	Equipped with tyres size 23×2" on steel, chromium plated rims The front and rear wheel are mutually interchangeable.
Brakes	Full-width hub brakes, brake drums with large ribs, dia 80 mm
Saddle	Comfortable, sprung, with rubber top
Electric equipment	Magnetto generator 6 Volt/18 Watt.
Accessories	Headlamp dia 80 mm, bulb with two filaments 6 Volt 15/15 Watt. Tail light 6 Volt 3 Watt Speedometer with kilometre counter Electric horn Luggage carrier combined with tool box Complete set of hand tools with air pump.
Weight of the moped	39 kg
Climbing ability	16 %.
Fuel consumption	1,5 lit. per 100 km

The moped is delivered in STANDARD or De Luxe execution The De Luxe execution is more richly chromium plated
According to the requirements of Police and Road Regulations in some states, engines are delivered also with 0,8 HP SAE and maximum speed of 30 km/H

Are you looking for a light, simple and economic vehicle which is reliable at the same time?

OUR REPLY IS THE MOPED STADION S 11

THE MOPED STADION WITH ENGINE JAWA

MOTOKOV

PRAHA– CZECHOSLOVAKIA

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JAWA-ČZ 125 - 175

Economy of operation, riding comfort, easy handling, speed and stamina – these are the features making the way to every part of the world for the JAWA-CZ motorcycles. The JAWA-CZ motorcycles are endowed with the most up-to-date technical improvements, well tested and proved in numerous victorious trials and races.

- AUTOMATIC CLUTCH RELEASE when shifting gears. – The clutch control lever serves for releasing the clutch on get-aways only. When shifting gears while in motion, the clutch is thrown off automatically.
- A SINGLE LEVER SERVES BOTH FOR GEAR SHIFTING AND FOR STARTING the engine. After the engine has been started the lever automatically resumes its shifting position – another feature facilitating the handling.
- 16" WHEELS – reduce the unsprung weight to the minimum, thus ensuring better riding comfort and more pleasure.
- THE COWLINGS OF THE REAR PART AND DEEPLY VALANCED MUDGUARDS – ensure perfect protection of the rider from dirt from the road surface or from the engine and facilitate cleaning of the machine.
- SWITCHBOX BUILT INTO THE HEADLAMP – improves the appearance of the machine and facilitates fitting.
- WIDER MOUNTING OF THE REAR PIVOTED FORK – increases riding safety.
- EFFICIENT INTAKE AND EXHAUST SILENCERS – reduce the noise below the specified limit.

TECHNICAL DATA

	125 c. c.	175 c. c.
Engine	Two stroke air cooled single cylinder	
Bore/Stroke	mm 52/58 In 2.05/2.28	mm 58/65 in 2.28/2.56
	c. c. 123.2	c. c. 171.7
Swept volume	cu. in. 7.518	cu. in. 10.478
Compression ratio	7 to 1	
Power output	6 HP/4750 RPM	9 HP/4750 RPM
Gearbox	Four speed type	
Carburettor	JIKOV 2922 M	JIKOV 2924 M
Front suspension	Telescopic fork with hydraulic suspension dampers	
Rear suspension	Pivoted fork	
Tyre size, front	3.00 X 16"	3.00 X 16"
rear	3.00 X 16"	3.25 X 16"
Brakes, dia.	140 mm or 5.512"	
Fuel tank capacity	14 litres or 3.08 Imp. galls.	
Curb weight	112 kg or 246.9 lb	115 kg or 253.5 lb
Carrying capacity	150 kg or 330.7 lb	150 kg or 330.7 lb
Max. speed	80 km or 49.7 m. p. h.	95 km or 59 m. p. h.
Max. climbing ability, full load	37 %	38 %
Fuel consumption	lit./100 km m. p. l. g.	lit./100 km m. p. l. g.
(speed 50 km or 31. l. m. p. h.)	2 141	2.3 122.6

JAWA-CZ MOTORCYCLE – THE WORLD'S TOPSELLER

MOTOKOV • *Praha* • *CZECHOSLOVAKIA*

MO 2026/72 a - 5811 SG - 1 - 13787 - 58

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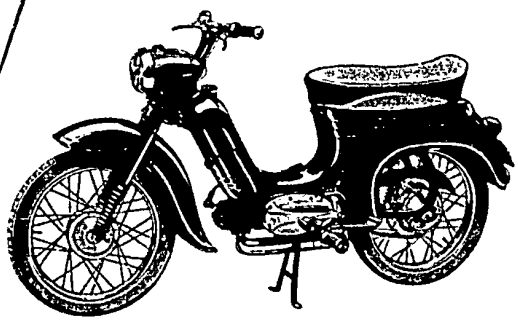
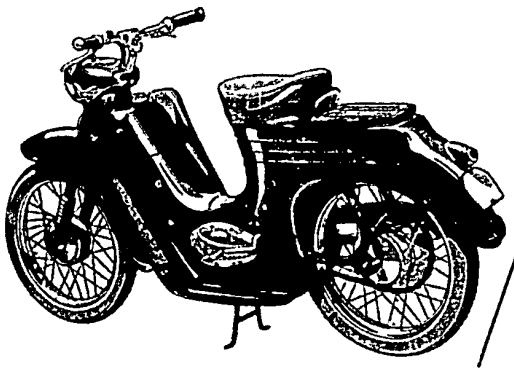
Speed
Elegance
Comfort
Economy

JAWA 555 incorporates all these advantages

JAWA — World's Topseller



JAWA



SPECIFICATION:
JAWA two-stroke single-cylinder engine — Cylinder capacity 49.8 c. c. — Output 2.2 B. H. P. — Three speed gear box — Central frame — Springing: front telescopic fork, rear pivoted fork — Wheels: provided with 2.50×16" tyres — Brakes: full width hub, dia 125 mm. — Magdyno 6 V/20 W — Electric horn — Speedometer — Weight 54 kg (119 lbs) — Speed: 60 km. p. h. (37 m. p. h.) -- Fuel consumption: 1.8 ltr. p. 100 km (155 m. p. g.)
Version: motor cycle or scooter
Both supplied with standard or long saddle
Standard or De luxe execution
Colours: Red, light blue, light green or black

MOTOKOV PRAHA — CZECHOSLOVAKIA

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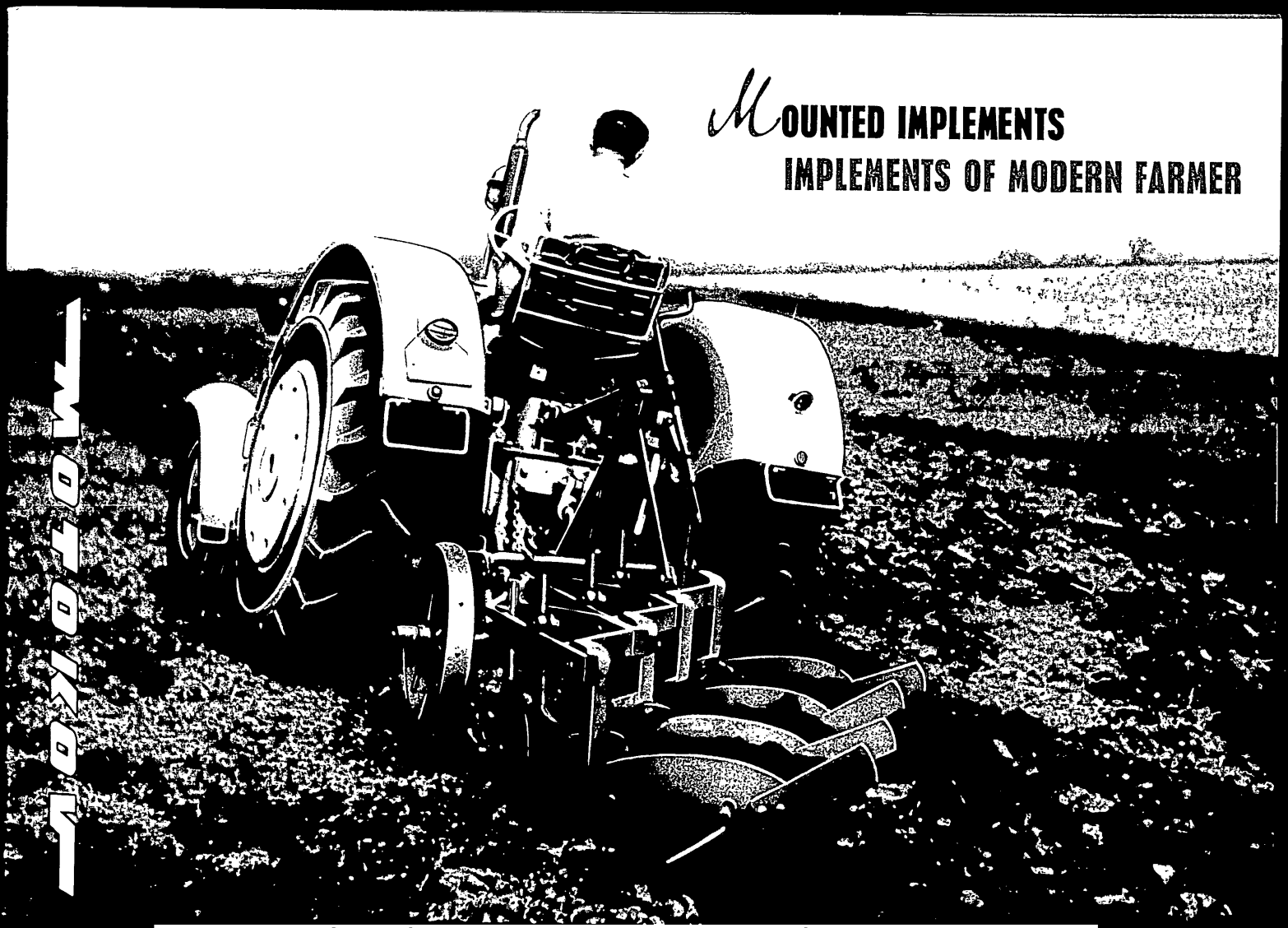

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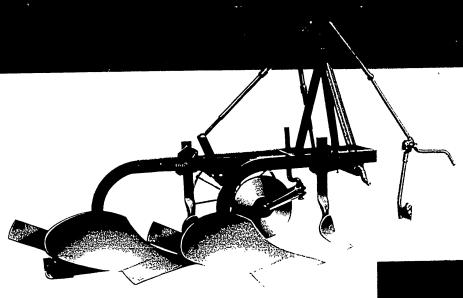
MOUNTED IMPLEMENTS

for tractors with hydraulic power lift

Mounted implements such as ploughs, cultivators, disc ploughs for shallow ploughing, hoes, seed drills, ridgers and semi-mounted mowers of Czechoslovak production are the most suitable and necessary complementary members of the ZETOR tractors. Owing to their quality as well as possibility of using them in different soil and climatic conditions and, especially, with respect to their up-to-date design, these implements have become an indispensable helper of every farmer who is interested in good and rapid tillage of the soil and who is anxious to carry out individual farming jobs in time. These implements can also be operated with other types of tractors of about 20—40 H.P., assuming that they are provided with the hydraulic power lift



The PN 252

TWO-FURROW MOUNTED PLOUGH can be operated as in the case of all mounted ploughs and other mounted implements only with a tractor which is provided with the hydraulic power lift. It is designed like the other mounted implements of Czechoslovak make especially for the hydraulic power lif of the ZETOR 25 A and ZETOR 25 K Diesel tractors. This plough, however, can also be attached to the hydraulic power lift of other types of tractors with a power output of about 20—28 H.P. after effecting some slight changes in its design. The PN 252 plough is a sturdy implement used for medium-deep and deep ploughing in light, medium as well as heavy soils. The mouldboards of this plough are made like those of other ploughs of Czechoslovak make of three-layer armour steel; the outer layers are hardened and their working surface is ground and polished. The plough is provided with a disc coulter dia. 380 mm, two removable skim coulters, spare shares for each bottom, spanners and a grease gun. The total working width of the plough amounts to 60 cm, i.e. 24", the cutting width of one share being 30 cm, i.e. 12". The maximum cutting depth is 25 cm and the weight of the implement amounts to approx. 265 kg. The approximate output of this plough is 0,25 ha/hr. at a working speed of 5 km/hr.

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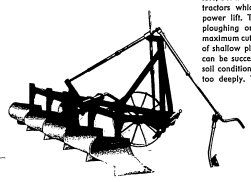
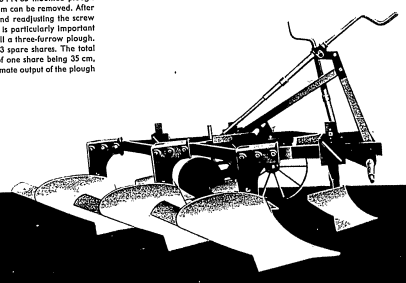
The PN 532

FIFE-FURROW MOUNTED PLOUGH is also designed especially for the ZETOR 25 Diesel tractors, but it can also be operated with other types of tractors which are provided with the hydraulic power lift. This plough is used only for shallow ploughing or working in stubble fields up to a maximum cutting depth of 12 cm. With the exception of shallow ploughing the PN 532 mounted plough can be successfully used particularly under those soil conditions which do not allow the soil to open too deeply. This plough is equipped with a disc coulter dia. 320 mm, five spare shares, two spanners and a grease gun. The total working width of this plough is 125 cm, i.e. 50". The weight of the implement amounts to approx. 240 kg. The approximate output of the plough is 0,35 ha/hr. at a working speed of 5 km/hr.



The 3 PN 35

THREE-FURROW MOUNTED PLOUGH is designed in the first place for the ZETOR SUPER 42 H.P. Diesel tractors with hydraulic power lift. This plough, however, can also be attached to the hydraulic power lift of other types of tractors with a power output of 40—50 H.P. after effecting some modifications in its design. The plough is of an extra sturdy construction; and for this reason it is well suited to operate even in the heaviest soils. It is used for both medium-deep and deep ploughing up to a maximum cutting depth of 28 cm. The cutting depth as well as the cutting width are controlled by means of two adjusting screws which are easily accessible from the seat of the tractor driver; this method of adjustment is used at all mounted ploughs of Czechoslovak origin. The main advantage of the 3 PN 35 mounted plough consists in the fact that the rear section of the frame with the mounted on bottom can be removed. After removing this section of the frame, displacing the land wheel with its axle and readjusting the screw type control, the plough can be easily converted into a two-furrow unit. This is particularly important in extra hard soils with highest soil resistance, where the tractor could not pull a three-furrow plough. The plough is equipped with a disc coulter, 3 removable skim coulters and 3 spare shares. The total working width of this plough amounts to 105 cm, i.e. 42", the cutting width of one share being 35 cm, i.e. 14". The weight of this implement amounts to approx. 465 kg. The approximate output of the plough is 0,35 ha/hr. at a working speed of 5 km/hr.



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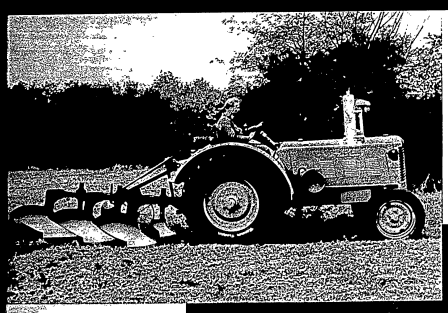
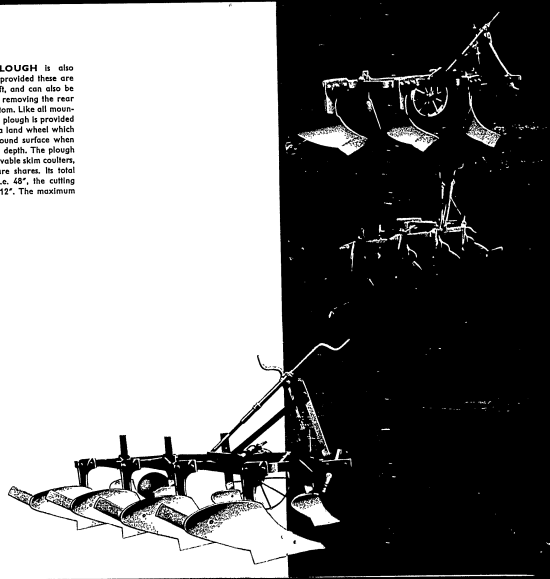


The 4 PN 30

FOUR-FURROW MOUNTED PLOUGH is also designed for tractors of 40—50 H.P., provided these are equipped with the hydraulic power lift, and can also be converted into a three-furrow unit by removing the rear section of the frame and the fourth bottom. Like all mounted ploughs of Czechoslovak make this plough is provided on the left-hand, i.e. fallow side with a land wheel which follows exactly the contour of the ground surface when ploughing, thus controlling the cutting depth. The plough is equipped with a disc coulter, 4 removable skim coulters, a spanner, a grease gun and 4 spare shares. Its total working width amounts to 120 cm, i.e. 48", the cutting width of one share being 30 cm, i.e. 12". The maximum cutting depth is 25 cm.



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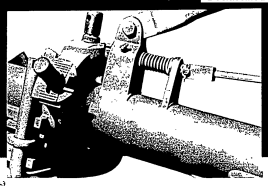
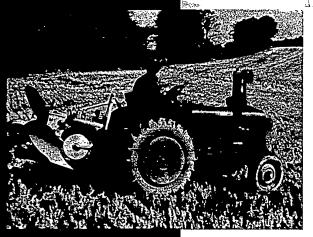
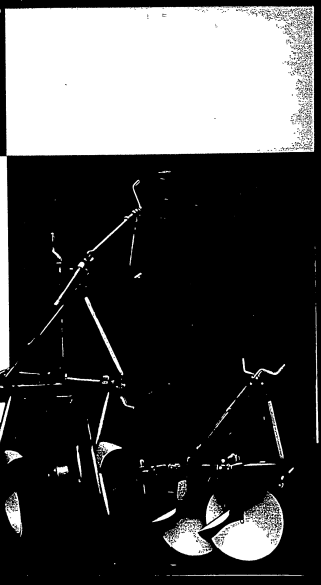




Diesel tractor with hydraulic power lift. This plough is of very solid construction and can, therefore, operate even in the hardest soils. The total working width of this plough amounts to 70 cm, i.e. 28", the cutting width of the individual shares being 14", i.e. 35 cm. The maximum cutting depth is approx. 27 cm. The shares of this plough, too, are reversed full-automatically.

of this plough is 70 cm, i.e. 28". The rear coulter wheel is adjustable with regard to the cutting depth, the cutting width and the inclination. The diameter of the discs is 65 cm, i.e. 26". The approximate weight of this implement amounts to 330 kg.



The 1 PNO 35

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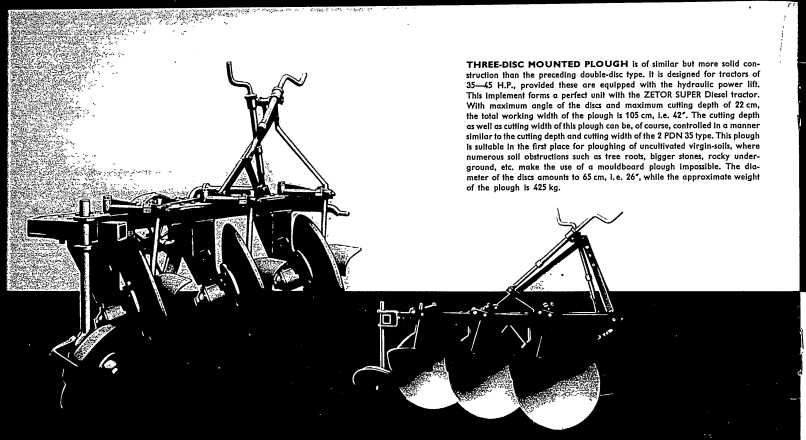
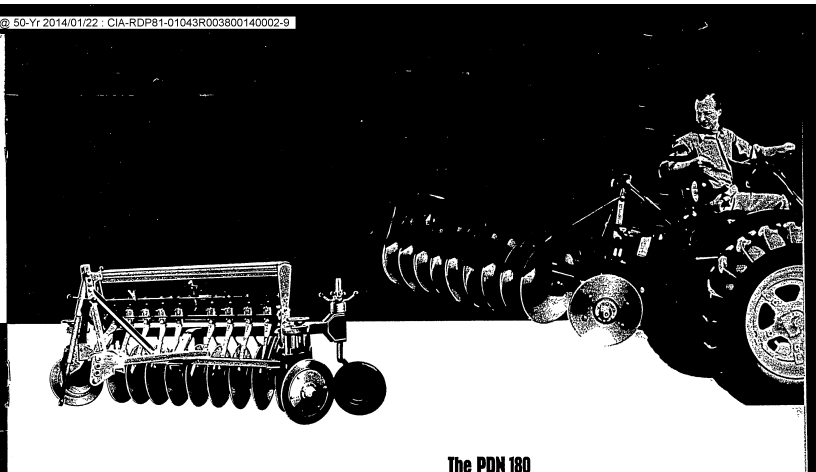


THREE-DISC MOUNTED PLOUGH is of similar but more solid construction than the preceding double-disc type. It is designed for tractors of 35—45 H.P., provided these are equipped with the hydraulic power lift. This implement forms a perfect unit with the ZETOR SUPER Diesel tractor. With maximum angle of the discs and maximum cutting depth of 22 cm, the total working width of the plough is 105 cm, i.e. 42". The cutting depth as well as cutting width of this plough can be, of course, controlled in a manner similar to the cutting depth and cutting width of the 2 PDN 35 type. This plough is suitable in the first place for ploughing of uncultivated virgin-soils, where numerous soil obstructions such as tree roots, bigger stones, rocky underground, etc. make the use of a mouldboard plough impossible. The diameter of the discs amounts to 65 cm, i.e. 26", while the approximate weight of the plough is 425 kg.



The PDN 180

MOUNTED DISC PLOUGH FOR SHALLOW PLOUGHING is analogous to the foregoing type and differs from it in fact only with regard to the working width (i.e. 180 cm) and the number of discs (12). The diameter of the discs is 50 cm. The disc gang can be adjusted from 0° to 35° by means of an adjusting screw. The weight of the implement is 650 kg. This plough is designed for tractors of about 40 H.P.

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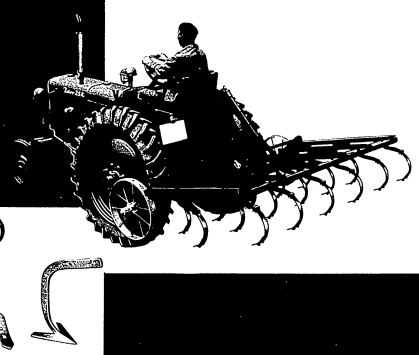

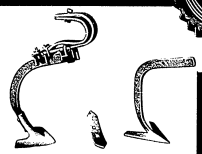

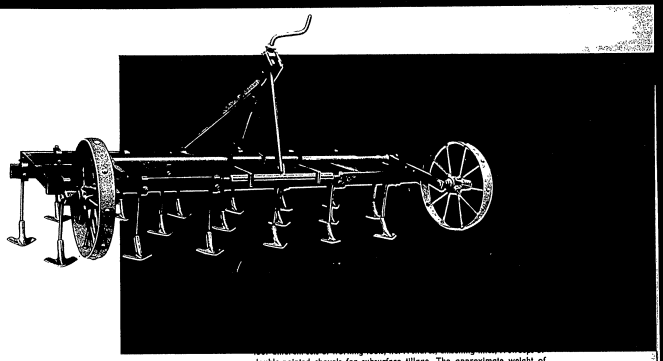

double-pointed shovels for subsurface tillage. The approximate weight of this implement amounts to 500 kg, while its working width is 280 cm.

The KHN 225

MOUNTED RIGID-TINE CULTIVATOR FOR SUBSURFACE TILLAGE is of similar design as the preceding type; it is, however, designed for lighter categories of tractors with a power output of about 25 H.P. This cultivator has 15 tines of different types: A-shares for cultivation up to approx. 12 cm, chiselling tines for a working depth of approx. 20 cm, double-pointed shovels for subsurface tillage in a depth of approx. 8 cm or A-sweeps for the same purpose. The working width of this implement amounts to 225 cm, while its approximate weight is 365 kg.

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The KPN 6

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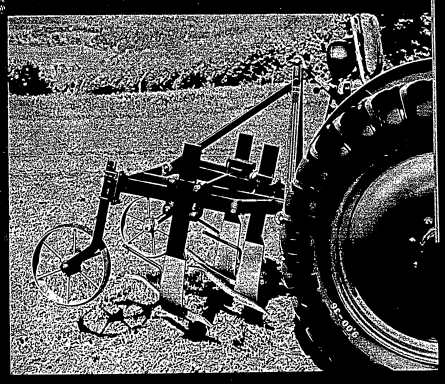
KPN 6/K

MOUNTED MAIZE HOE. The preceding hoe can be converted into an implement for cultivation of long-stem crops, particularly of maize, by increasing the ground clearance of the hoe frame as well as the cutting width of the working elements. The approximate weight of this hoe is 325 kg, while its approximate working width is 310 cm. When working, the ground clearance of the hoe frame amounts to 60 cm. The number of rows can be changed so that the implement operates 3—5 rows. The approximate working depth of the hoeing teeth amounts to 8 cm, the output of the hoe being about 1,2 ha/hr.

The HN 41

FOUR-ROW MOUNTED RIDGER has 5 ridging bodies and is used in the first place for hilling potatoes and other row crops, ridging, etc. This ridger is designed to be connected with the hydraulic power lift of the ZETOR 25 Diesel tractor; it can, however, also be operated with other types of tractors after effecting some slight modifications in its design. The ridging bodies can be adjusted for various row spacings within a limit of 60—70 cm; the wings of the ridging bodies are both vertically and laterally adjustable. The working depth can be controlled by changing the relative angles of the ridging bodies which are readjustable on the links of the parallel-



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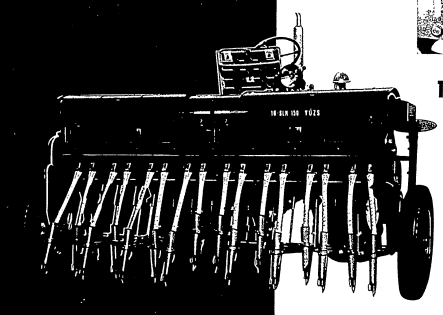
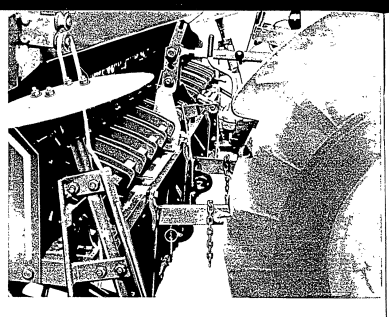
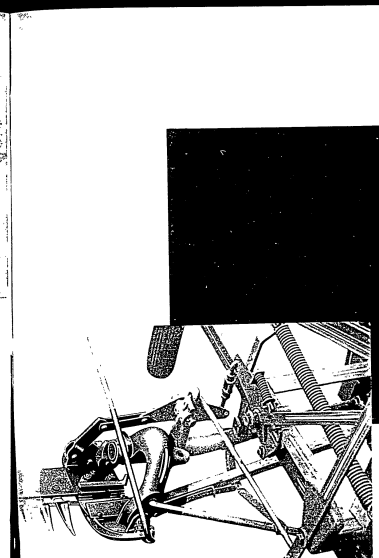
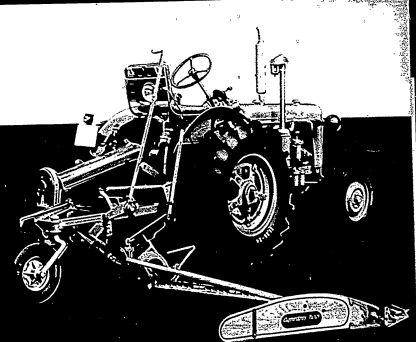




The 16 SLN 150

MOUNTED GENERAL PURPOSE SEED DRILL WITH ADJUSTABLE CUPS is designed to be attached to the hydraulic power lift of a tractor. The cup-feed mechanism of this seed drill is the same as the feed mechanism of the well-known UNIKUH-MELICHAR seed drills. This implement is designed for drilling cereal crops as well as for sowing all technical crops including those which have large seeds such as beans. When working, the seed drill runs on wheels with pneumatic tyres and its feed mechanism is driven by the transmission gears from the left travelling wheel. The drive of the feed mechanism automatically stops when the seed drill is raised by the hydraulic power lift of the tractor. The working width of this implement is 240 cm, the number of rows being 16 and the inter-row spacing amounting to 15 cm; the number of beet rows is 6, the inter-row spacing in this case being 45 cm. Hopper capacity amounts to 150 cm³. The output of the seed drill is 1.5 ha/hr. at a working speed of 8 km/hr. Pneumatic tyre dimensions: 5.50 x 16. The total weight amounts to approx. 500 kg.





The ŽT 183

SEMI-MOUNTED MOWER consists of a right-hand cutter bar hinged to a fork-shaped connecting arm which is coupled in the same flexible manner to the frame of this implement. The cutter bar is of a medium-cut type and its working width amounts to 183 cm. The cutting height is controlled partly by means of two vertically adjustable shoe soles, partly by adjusting the cutting angle of the cutter bar. The knife is driven from the P.T.O. shaft of the tractor by means of a telescoping shaft with universal joints. If the cutter bar strikes a larger obstruction, a break-away release snaps open allowing the whole mower to swing back. The implement can also be supplied with a cutter bar of the low-cut type. The approximate weight of the mower amounts to 210 kg. while the maximum working is 6 km/hr.

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perfect manoeuvreability

high working speed

operation and control of these implements direct from the dirver's seat

easy and quick interchangeability of different types of mounted implements

quick road transport

relatively reasonable price which is closely connected with the low weight of the mounted implements as compared with that of drawn ones

As the construction and design of all machines are constantly being improved and developed, the MOTOKOV-PRAHA reserves the right

Specifications:

Type of implement	Length		Width		Height		Cutting width of 1 share (disc)		Total working width		Maximum depth		Distance between shares		Number of shares (discs)		Number of rows	Inter-row spacing		Approximate net weight		Approximate gross weight		Approximate cubic measurement of case		Output at a speed of 5 km/hr.	
	cm	ft	cm	ft	cm	ft	cm	inch	cm	ft	cm	inch	cm	inch				cm	inch	kg	lbs	kg	lbs	m^3	cm ft	ha	acre
PN 252	205	6'9"	117	3'10"	145	4'9"	30	12"	60	2'—	25	10"	63	25"	2	—	—	—	—	265	584	315	695	0,35	12,1/4	0,25	0,62
PN 332	228	7'6"	146	4'10"	131	4'4"	25	10"	125	4'1"	12	5"	37	15"	3	—	—	—	—	240	529	308	679	0,39	13,1/2	0,35	0,86
3 PN 35	250	8'2"	164	5'5"	150	4'11"	35	14"	105	3'5"	28	11"	65	26"	3/2	—	—	—	—	465	1025	550	1213	0,76	26,1/2	0,45	1,10
3 PN 35/12	250	8'2"	164	5'5"	150	4'11"	30	12"	105	3'5"	28	11"	65	25"	4/3	—	—	—	—	460	1014	540	1191	0,76	26,1/2	0,70	1,70
4 PN 30	287	9'5"	151	5'—	143	4'8"	30	12"	120	3'11"	23	10"	63	25"	4	—	—	—	—	240	529	310	684	0,34	12	0,15	0,40
1 PNO 35	150	4'11"	150	4'11"	125	4'1"	30/35	12"/14"	30/35	1'1"/1'2"	27	11"	70	28"	1+1	—	—	—	—	410	904	510	1125	0,77	27	0,30	0,75
2 PNO 35	210	6'11"	120	3'11"	135	4'6"	35	14"	70	2'4"	22	9"	—	—	2+2	—	—	—	—	330	728	390	860	0,54	19	0,30	0,75
2 PNO 35	210	6'11"	120	3'11"	152	5'—	35	14"	70	2'4"	22	9"	—	—	2	—	—	—	—	425	937	490	1080	0,76	26,1/2	0,45	1,10
2 PDN 35	163	5'4"	110	3'7"	152	5'—	35	14"	105	3'5"	22	9"	—	—	3	—	—	—	—	330	728	470	1036	0,78	27,1/4	1,35	3,20
3 PDN 35	232	7'7"	119	3'11"	145	4'9"	—	—	253	8'4"	12	5"	—	—	17	—	—	—	—	275	606	395	871	0,85	29,3/4	1,40	3,45
KN 170 P	184	6'—	248	8'2"	130	4'3"	—	—	270	8'10"	12	5"	—	—	19	—	—	—	—	490	1080	680	1500	1,40	49,—	1,20	2,95
KN 190	185	6'1"	278	9'1"	126	4'2"	—	—	310	10'2"	8	3"	—	—	6	3	3—5	38—80	15—32"	490	1080	680	1500	1,40	49,—	1,20	2,95
KPN 6	310	10'2"	160	5'3"	112	3'8"	—	—	310	10'2"	8	3"	—	—	6	3	3—5	38—80	15—32"	490	1080	680	1500	1,40	49,—	1,10	2,70
KPN 6/K	310	10'2"	160	5'3"	112	3'8"	—	—	—	—	—	—	—	—	6	4	—	60—70	24—28"	160	353	250	551	0,53	19,1/4	0,38	0,96
HN 41	123	4'—	288	9'5"	122	4'—	—	—	—	—	—	—	—	—	5	3	—	40—50	16—20"	200	441	250	551	0,38	13,1/4	0,35	0,86
VRN 5	160	5'3"	170	5'7"	115	3'9"	—	—	—	—	—	—	—	—	9	—	—	—	—	430	948	530	1169	0,76	26,1/2	1,—	2,50
PDN 120	150	4'11"	185	6'1"	140	4'7"	—	—	120	3'11"	8—12	3"—5"	18	7"	9	—	—	—	—	650	1433	780	1720	0,95	33,1/4	1,30	3,20
PDN 120	150	4'11"	222	7'4"	125	4'1"	—	—	180	5'11"	8—12	3"—5"	15	6"	12	—	—	—	—	525	1158	680	1500	1,25	43,3/4	0,80	2,—
PDN 180	182	6'—	222	7'4"	155	5'1"	—	—	280	9'2"	20	8"	—	—	19	—	—	—	—	365	805	450	993	0,75	26,1/4	0,60	1,50
KHN 280	179	5'11"	280	9'2"	150	4'11"	—	—	225	7'3"	20	8"	—	—	15	—	—	—	—	500	1103	610	1345	0,77	27	1,50	3,70
KHN 225	178	5'10"	233	7'5"	150	4'11"	—	—	240	7'11"	—	—	—	—	16	15	6"	—	—	210	463	265	584	0,65	22,3/4	1,—	2,50
16 SLN 150	145	4'9"	283	9'3"	135	4'5"	—	—	183	6'—	—	—	—	—													
Z-T 180	162	5'4"	183	6'—	120	3'11"	—	—																			

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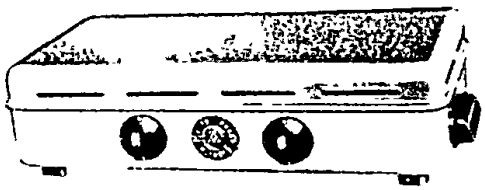
ELEKTRO·PRAGA



TYPE 038 ELEKTRO-PRAGA
ELECTRIC DOUBLE COOKER

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The new model of the electric twin hot plate is a welcome contribution mainly for small households. It surpasses the hitherto available types of cookers with its form as well as output. It will become your reliable helper in cooking, frying, stewing, warming, etc.

TECHNICAL DATA:

Dimensions. height 125 mm (4,9 ins.), width 495 mm (19,5 ins), depth 255 mm (10 ins)

Weight 5.5 kg (12 lbs) Total input 2.000 W

Smaller high-speed plate. diameter 145 mm (5,7 ins.), input 800 W (185–275–800 W) Bigger high-speed plate: diameter 180 mm (7,1 ins.), input 1200 W (250–350–1200 W)

Voltage 220 V or 120 V according to the data on the label When using the cooker on 120 V connection to a 15 A socket is necessary! The cooker is delivered with a firmly connected three-core cable with a protected plug

DESCRIPTION OF THE COOKER:

The cooking plates are located under a detachable cover on drip reflex pans. They are firmly connected with the base In the case of a defect an exchange will be executed by every specialized electrical engineering shop

Each plate is controlled by an independent 4-position switch, its regulation knob being located on the front side of the base. To each plate corresponds the nearest regulation knob The regulation knob can be turned in both directions, the usual direction used being to the right. The regulation stages are marked by the numbers 0–1–2–3 on the rim of the knob, 0 signifying switched off and 3 maximum input. The switched on position is always marked by that number which covers the mark of the base of the cooker. Between the two regulating knobs there is the control light, which lights up after switching on any of the switches, giving warning that the cooker is connected with current.

INSTRUCTION FOR OPERATION:

The twin cooker can be connected only to a voltage identical with the data on the type label.

Push the plug of the supply cable into the socket. Take off the lid of the cooker

Place the cooking vessel with the contents on the plate.

Switch on the corresponding regulating knob to the highest – 3rd stage. After the contents of the vessel have started boiling switch over to the 2nd or 1st stage so that the state of boiling be maintained.

Never switch on the plate with no load, because the tubular plate immediately starts heating and the warmth would thus ineffectively escape into the surroundings.

On completion of cooking, never replace the cover until the plates have cooled down.

INSTRUCTION FOR COOKING:

The vessels used should be of the same or possibly a 1–2 cm greater diameter than the plates. See that the vessels are flatbottomed. The most suitable vessels are special aluminium electric utensils which are actually more expensive, but whose smaller power consumption will refund their purchasing cost.

When cooking always cover the vessels with a lid, you will save power as well as the precious contents of the foodstuffs and time.

MAINTENANCE OF THE COOKER:

The cooker must be maintained in a clean and orderly state not only to ensure its good appearance, but mainly in the interest of durability, efficient output and safety of operation. When in normal use the cooker should be properly cleaned once a week and always when foodstuffs spill over on to it.

During cleaning the supply cable should be disconnected from the socket, the plates cooled down. The plates and the drip pan are cleaned with a wet cloth, soaked, if necessary, in a soap or soda solution, and then dried with a dry cloth. Never use rough cleaning media (powders, wire-gauzes, etc) in order not to damage the surface of the cooker.

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MORA 241

MOTOKOV

PRAHA – CZECHOSLOVAKIA

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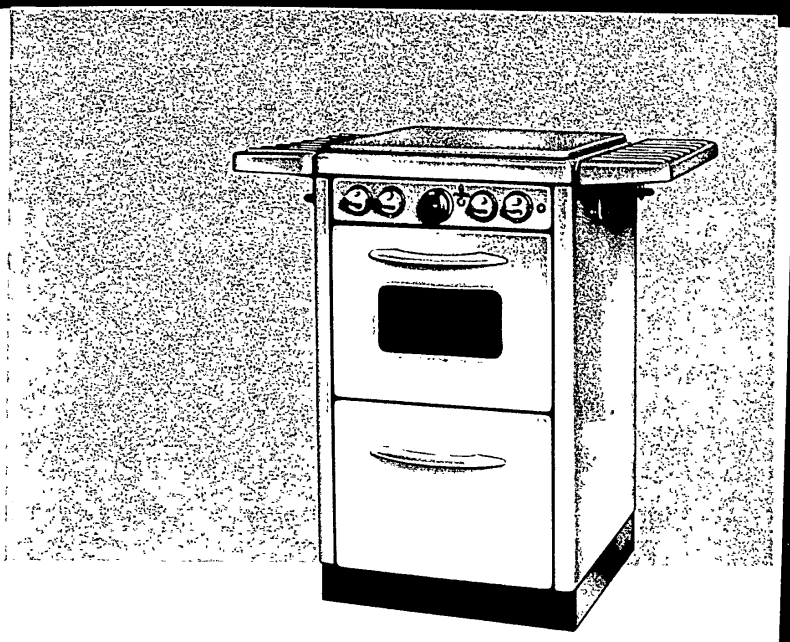
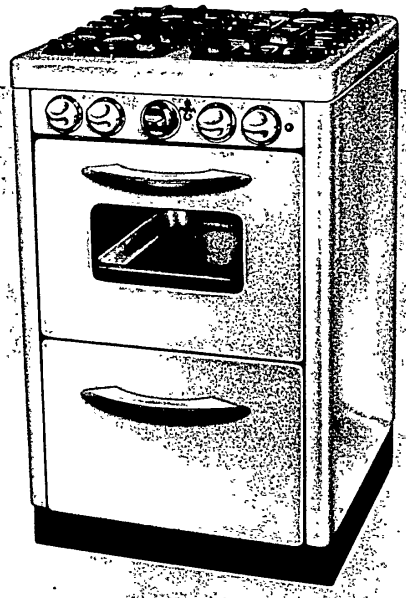
MORA

MORA 241

Description: The stove is box shaped and coated with hard white enamel all over its surface. The burner grating is enamelled black. The sheet iron cooking plate is coated with white hard enamel. The cover is provided with rubber stops and underneath the burners is an extractable underplatte.
The stove has four cooking burners in three sizes, and two ovens. The upper for baking and the lower for grilling. The two ovens are heated by a single burner which when turned into either of two limit positions is used for baking or for grilling. All





the burners are of universal design so that with the appropriate nozzles the stove can be heated with town gas, liquid gas (propane-butane), or with methane. The cooking rings have a central ignition, the ignition flame burner being in the middle of the cooking plate below a lid. The oven burner is equipped with thermostatic regulation. Into the door of the baking (upper) oven is set an inspection window provided with special double glass. The inside of the oven is illuminated by an electric lamp fitted into the rear wall and controlled by a switch which is to be found on the panel at the right, next to the cocks.
One or two side plates are supplied as accessories.
MORA kitchen range, type 241 can be also delivered in the following variations:
Type 242 - same as type 241 but without the thermostat.
Type 244 - same as type 241 but without the thermostat, the sight glass and illumination of the baking oven and without the central lighter of the cooking burners.

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TECHNICAL DATA

Burner output	Kcal/hour	Approx. Gas Consumption in litres per hour: Town-Gas	Propane Butane	Methane
large cooking	1900	450	80	210
small cooking	900	230	40	100
medium cooking	1350	340	60	150
Oven burner	3000	750	130	330

This is the approximate consumption at a gas pressure in the supply pipe of:	60 mm w.c. 2 6/16"	500 mm w.c. 19 11/16"	175 mm w.c. 6 7/8"

Dimensions: height 86 cm - 33 7/8 inch; with lid 88,2 cm - 34 11/16"
width 52 cm - 20 7/16 inch; depth 52 cm - 20 7/16 inch;
width of side plate 17,5 cm - 6 7/8 inch;
gas branch 1/2" at 76 cm height - 29 15/16 inch.
Weight: net 86,5 kgs - 191 lbs; gross 125 kgs - 268 lbs
Size of case 0,5 cu metres 18 cu. ft.

MORA

MOTOKOV

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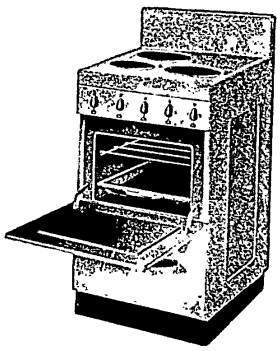

TYPE T 130 ELECTRIC KITCHEN RANGE

An attractive and useful supplement of the modern kitchen suitable for medium size and larger households.

Technical Description:

The range is built of steel with the entire surface finished in white, hard silicon enamel. The inside wall of the door and the oven and baking tin are finished in "granite" coloured enamel.

The range has three cooking plates 145, 180 and 220 mm (5¾", 7⅛" and 8⅝") in diameter with a total input of 3800 Watts and an oven with four heater elements (2 each at the top and bottom) with a total maximum input of 1200 Watts. The maximum total input of the range is therefore 5000 Watts Individual plates and both pairs of the heater elements of the oven are regulated in three positions by means of changeover switches fitted above the oven and provided with markings of the positions (0-1-2-3) and of the heater element concerned

A drawer serving for the storage of the accessories of the oven and dishes, etc., is arranged underneath the oven The cooking plate panel, which is fitted at the back with a shield, is removable to give access to the cooking plates (for servicing and cleaning) and drip pan The handles of the oven

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and drawer are made of insulating material The door of the oven has a stop in an intermediate position (half-closed) for airing

Standard equipment 1 grill, 1 baking tin, 2 baking trays.

Available as optional equipment are 1 or 2 side extension panels

Possibilities of connection 380 220 Volts, three phase
220 or 110 (120) Volts, three phase
220 or 110 (120) Volts, single phase

If the range is to be used on a 110 (120) Volt system this has to be stated in the order because it requires replacement of the heater elements

Specification:

		Position	1	2	3	
Inputs:	Small cooking plate (left hand, front)		200	400	800	Watts
	Medium size cooking plate (right hand, front)		300	600	1200	Watts
	Large cooking plate (rear)		450	900	1800	Watts
	Each pair of heater elements of oven (top and bottom)		150	300	600	Watts
Overall dimensions of range	height (without rear shield)			860 mm	34"	
	width			500 mm	20"	
	depth			600 mm	24"	
rear shield	height			150 mm	6"	
Inside dimensions of oven	height			230 mm	9"	
	width			330 mm	13"	
	depth			475 mm	18½"	
Weight	net			60 kg	132 lbs	
	gross, approx			85 kg	187 lbs	
Volume, approx.		0.45 cu metres			16 cu. ft.	

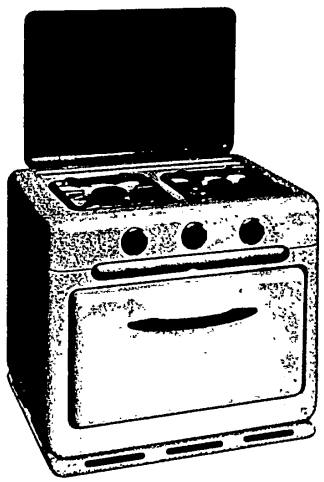
MOTOKOV - PRAHA - CZECHOSLOVAKIA

COK 51819 a - 5503

Printed in Czechoslovakia.

The Problem of

COOKING AND BAKING QUICKLY AND ECONOMICALLY



Can only be solved by the gas oven with cooking rings

CALORIA

611

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CALORIA
611

MODERN - ELEGANT - EFFICIENT

2 cooking ring burners provided with a cover and a removable underplate, the oven has a double U shaped burner All the burners are of the blue flame Bunsen type The whole surface is enamelled in white, the rear wall having a black protective varnish. The cooking burners and the rings are enamelled black. It is not connected to a chimney

Technical Data

Outer dimensions height 55,5 cm (21 13/16 ins.), width 59 cm (23 3/16 ins), depth 43 cm (16 15/16 ins)

Dimensions of oven height 21,5 cm (8 7/16 ins.), width 47,6 cm (18 11/16 ins), depth 33 cm (13 ins)

Inputs: large cooking burner (right) 2 000 kcal/hour
small cooking burner (left) 1 600 kcal/hour
oven burner 2 800 kcal/hour

The stove can be supplied for use with town gas, or with liquid gas (propane-butane)

Weight: net 47 kilos — 103 1 2 lbs
gross approx. 70 kilos — 154 lbs.
approx. size of box approx 0,33 cu. metres — 10 1/2 cu. ft.

MOTOKOV
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COK 54838 a — 5505

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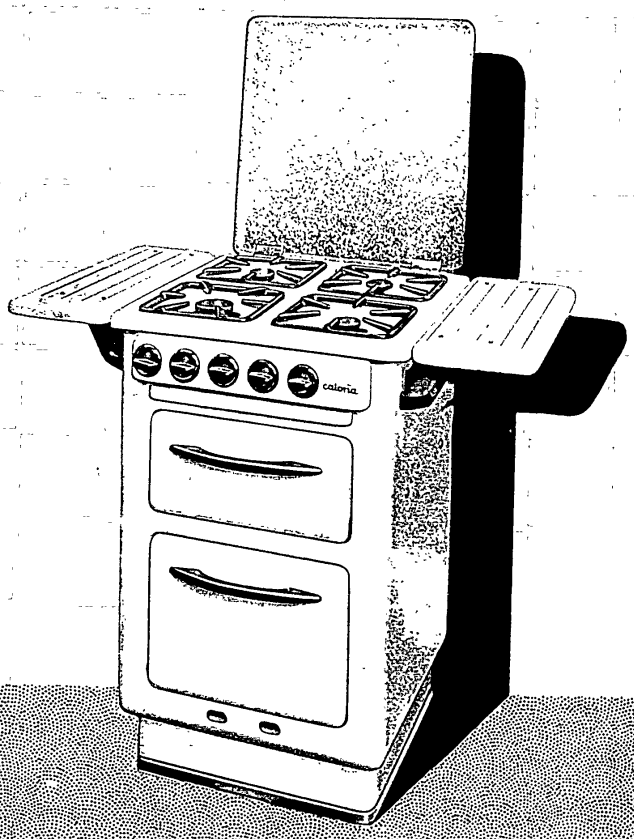
THE caloria 114
GAS RANGE



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THE caloria 114

GAS RANGE

Description

The "Caloria 114" Gas Range represents a suitable supplement of a modern kitchen. Its entire surface as well as the pressed sheet iron cooking plate and both the lay-off plates are white enamelled. The removable burner grids are black enamelled. The entire cooking plate is covered with an easily removable cover of attractive shape, also finished in white enamel. The range is fitted with four cooking burners, the front one of which on the left hand side is larger, in addition to a double oven burner and a grilling burner in the top wall of the oven. Above the oven a compartment for warming plates and for keeping dishes at the desired temperature is provided. The bottom of the cooking space is formed by a sliding drip-off plate enabling easy cleaning. The control panel is fitted with knobs of suitable shape set into nickel-plated frames with markings of the knob positions. The doors of the oven and the warming compartment are fitted with conveniently shaped handles made of new, heat insulating plastics.
The burners are easy to remove and have a mixing chamber with a regulating diaphragm for the primary air, ensuring perfect and economical combustion.

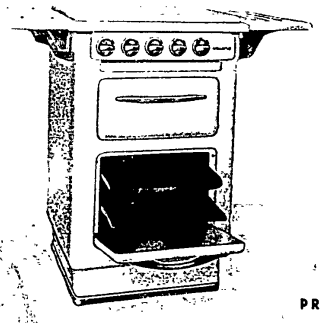
Advantages in comparison with the old design "Prometheus 112 A" a modern attractive appearance and a smarter outer finish. In respect of performance, the combustion of gas, heat distribution, and the insulation of the oven have been improved.

Specification

Dimensions of cooking plate	52 × 51 cm	20 1/2 × 21 1/4 ins.
Dimensions of baking oven	33 × 47.5 × 23 cm	13 × 18 3/4 × 9 ins.
Dimensions of warming compartment	30 × 47.5 × 12.5 cm	11 3/4 × 18 3/4 × 5 ins.
Dimensions of range without lay-off plates	86 × 52 × 51 cm	34 × 20 1/2 × 21 1/4 ins.
Dimensions of lay-off plates	20 × 51 cm	8 × 21 1/4 ins.
Net weight	78 kg	172 lbs.
Gross weight (in wooden case)	117 kg	258 lbs.
Dimensions of wooden case	66 × 73 × 96 cm	26 × 29 × 38 ins.

Gas input (for city gas)

Medium cooking burners (three)	325 litres per hour	11 1/2 cu ft
Large cooking burner	470 litres per hour	16 1/2 cu ft
Oven burner	475 litres per hour	17 cu ft
Grilling burner	560 litres per hour	20 cu ft
Intake gas piping 1/2"		



Accessories

Baking tin, grate, grilling pan — all finished in enamel.
The CALORIA 114 gas range can be supplied for heating by coal gas or a mixture of propane and butane (liquid gas).

PRAHA - CZECHOSLOVAKIA

COK 54665 a - 5502 - Svět 06

Printed in Czechoslovakia

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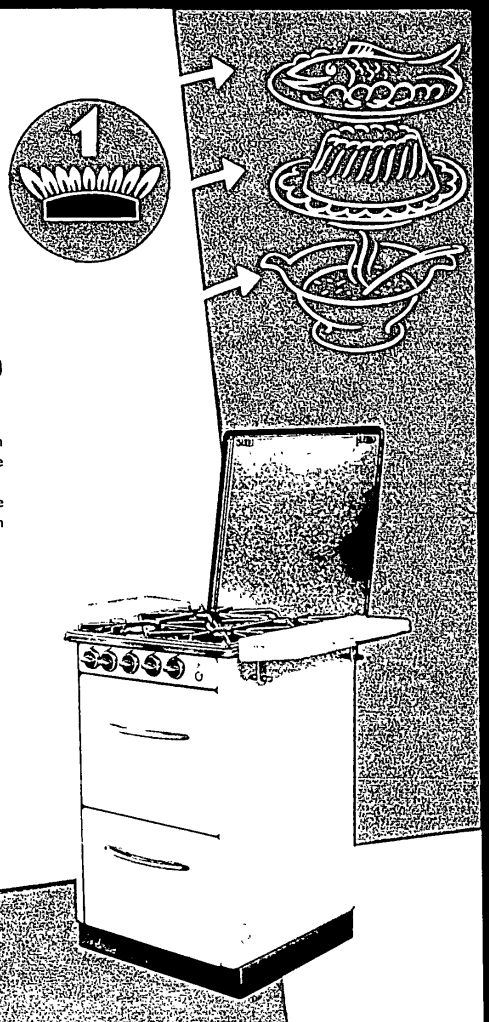
GAS STOVE

MORA 234

THIS IS A MODERN GAS COOKING STOVE WHICH WILL BE WELCOME IN ANY HOUSEHOLD



DESCRIPTION:

The stove is of box type shape, the front and the side walls as well as the cover and the side plates are of white enamelled steel plate. The cast iron pot support plate is enamelled in black. The inner wall of the cover, the drip-off plates and the underplate as well as the walls and the floor of the oven are finished in mottled grey enamel. The rear wall and the inside of the jacket are varnished black.

The cocks of the individual burners are arranged behind the fitting plate and are provided with bakelite regulating buttons. All the burners have mixing chambers with screens which allow regulating the supply of primary air. The horse shoe shaped oven burner is double and provided with tiltable grilling grates by which the stove can be adjusted for cooking in the upper or the lower oven.

The four cooking ring burners are of 3 different sizes. The left hand front burner is large, the right hand front burner is small and the two rear burners are of medium size. The oven burner is a technical novelty in its arrangement as it is common for the top baking oven and for the bottom grilling oven. The change-over of heating the top or the bottom oven is performed by simply pulling a handle which tilts the screens. While the baking oven is heated the grilling space can be used for keeping dishes hot and when the grilling oven is in use the top oven is still hot enough for baking. In this way full utilisation of the heating capacity of the burners is achieved.

The grill oven is arranged in drawer fashion. Its floor is provided with a raising mechanism enabling adjustment of the distance between the grilled dish and the burner. The lighting opening is at thefront of the baking oven floor and is provided with a cover. Both ovens are perfectly isolated against heat losses.

TECHNICAL DATA:

Dimensions of stove:	height 80 cm — 31 1/2 ins. width without side plates 52 cm — 20 1/2 ins. depth 60 cm — 23 5/8 ins.
Dimensions of side plates:	width 18 cm — 7 ins. length 60 cm — 23 5/8 ins.
Dimensions of the baking oven:	height 23 cm — 9 ins. width 33 cm — 13 ins. depth 47,5 cm — 18 3/4 ins.
Dimensions of grill oven:	height 19 cm — 7 1/2 ins. width 33 cm — 13 ins. depth 47,5 cm — 18 3/4 ins.

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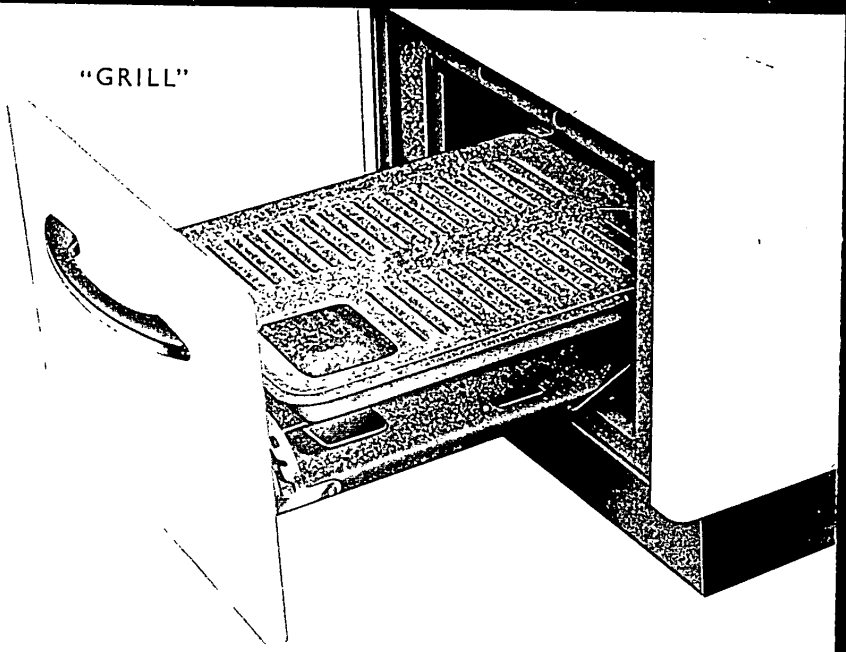
"GRILL"



Net weight: 86 kg — 190 lbs.

Gross weight 124 kg — 265 lbs.

Volume of packing case. 0,47 m³ — 17 cn. ft.

Burner consumption (for town gas, at the pressure of 60 mm water column):

large cooking ring 540 litres/hour — 19 cn. ft./hour
medium cooking ring 380 litres/hour — 13 1/2 cn. ft./hour
small cooking ring 230 litres/hour — 8 1/8 cn ft./hour
oven burner 700 litres/hour — 24 3/4 cn. ft./hour

Gas pipe diameter 1/2 inch.

The gas stove can be supplied for town gas or for Propane-butane.

Accessories. for the oven. 2 baking tins, 1 grill pan with grate, 1 wire grate.
for the gas rings: 1 adaptor ring, 2 cast iron simmering plates of different sizes.

Changes in the design and execution are reserved.

MOTOKOV

PRAHA-CZECHOSLOVAKIA

ČOK 54 '64 a - 5502

Printed in Czechoslovakia (Sčt 01-195-55)

Modern Women's Dream Come True!
The **ALBA-CYGNUS** *Washer*

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Just an attractive little washing machine - but how important for every house-wife!

changes drudgery into play

shortens laundering time

In a mere hour you can comfortably wash up to 33 lbs. of dry linen!

A few informative figures of ALBA - CYGNUS washer Type VP 32:

- The vessel (C) holds 35 litres ($7^2/_3$ gallons) of washing solution.
- Washing of one charge takes 2 to 5 minutes depending on the kind of materials to be washed.
- 1,500 r. p. m. is the speed at which the porcelain agitator (F) revolves.
- 1,485 r. p. m. is the speed of the spin-dryer (K).
- 86 cm ($33^{11}/_{12}$ ins.) height, 48 cm ($18^{11}/_{12}$ ins.) width, 73 cm ($28^3/_4$ ins.) length - those are the dimensions of the washer.
- 220 or 110 Volts A. C. is the voltage to which the washer may be connected.

It not only launders — but also dries

The washer and the spin-dryer are mounted in a common housing (A) which weighs 43 kg (95 lbs.) - thus it is the lightest machine of its kind in the world.

All is done by one switch (N)

By turning the switch to the right the washer is put into operation, by turning it to the left the spin-dryer is started. Thus the operation is most simple.

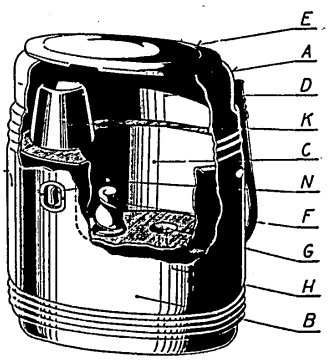
From the spin-dryer straight under the iron!

The washer works quickly and reliably. When the washing is taken out of the spin-dryer it needs only to be dried a little more and is then ready for ironing.

This washer saves many an expense

Alter centrifuging, the washing solution flows from the spin-dryer back into the washing vessel where it is ready to wash a further lot of clothes.

I'ts fun to wash with the Alba-Cygnus



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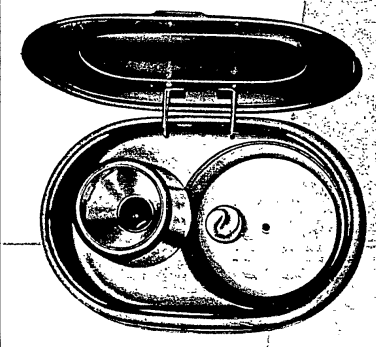
Technical Description

The washer with the spin-dryer is of oval shape. The washing space is 31 cm ($12^{1}/_{5}$ ins.) high. The upper rim of the vessel is protected by a rubber lining. The vessel is closed by a hinged lid (E). In the bottom of the washing vessel there is an eccentrically mounted porcelain agitator which revolves counter-clockwise round a vertical axis. At the lowest point of the vessel there is an outlet (G) with a pipe provided with a rubber hose (H), which passes through the floor hole in the stand. Its other end is held by a suspension hook fixed to the end of the hose.

The spin-dryer has a shaft passing through self-aligning bearings and elastically mounted in a rubber bush. The washing vessel and the spin-dryer are made of heavy non-corrosive aluminium sheet. The agitator and the spin-dryer are driven by means of two belt pulleys by a single-phase induction motor of 250 W wound for a mains voltage of 220 or 110 Volts and a frequency of 50 cycles. The motor is situated in the stand of the washer. It is provided with two electrolytic starting condensers. Each belt pulley has a built-in freewheel. For the power connection there is a 3×1 mm² cord provided at its end with a "Flexo" plug. On the front wall of the stand (B) there is a built-in changeover switch by which the washer and the spin-dryer are started when it is turned to the right or to the left respectively. When the switch is in the central position the washer is switched off.



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PRAHA-CZECHOSLOVAKIA

MO 5133 a - 5766 Printed in Czechoslovakia

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In what way does this gadget do your work?

THE MIXER - stirs, minces, grinds, twirls, cuts and crushes.

It is used in the preparation of meals and drinks by the most rational methods, as foodstuffs processed in this way will retain their maximum nutritive value in the most digestible form.

QUICKLY AND WITHOUT ANY EFFORT

It will prepare light egg dishes, fine spreads, soups, sauces, mayonaise, creams, puddings, emulsions of fats, all sorts of purées, fruit juices, jams, cocktails, ice cream mixtures etc.

The whisker will easily work batter and sponge mixtures for pies, tarts, petit fours, omelettes etc., stiffen whites of eggs, whipped cream etc.

THE WHISKER on a flexible shaft

This useful design enables the application of the whisker in any vessel placed on the table, or eventually even on a range, cooker etc., according to need

The wire beaters are actuated by a push button on the handle and the number of revolutions is adjustable up to 1,000 r. p. m.

The attendance is simple and absolutely safe.

THE COFFEE GRINDER

with adjustable grinding device, enabling to achieve the finest grind, according to the wish and satisfaction of the most pretentious connoisseurs of this delicious beverage.

It will grind in 1 minute a sufficient quantity for 8 portions of strong coffee easily.

Mixer glass container - contents 1 litre.

Coffee grinder filling mouth - contents 10 dkgs (3.5 oz.).

Flexible shaft of whisker - length 56 cms (19,8 in.)

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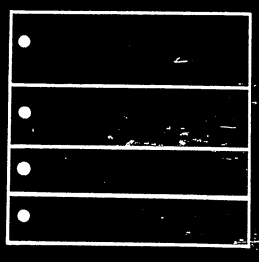
PRAGOMIX



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PRAGOMIX UNIVERSAL

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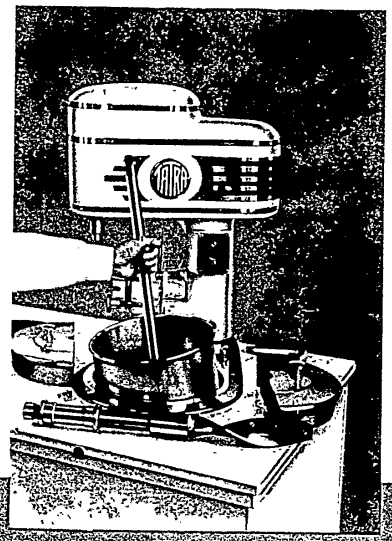
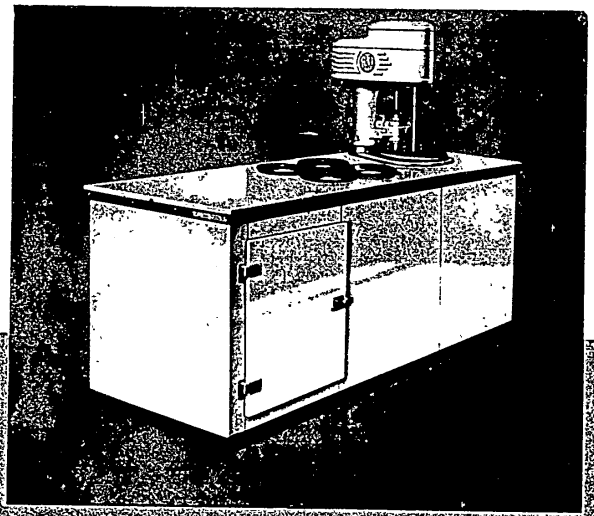


TATRA - DELIKATA ZP 2048
ICE CREAM FREEZER



Capacity of the freezing can	litres	20
Number of storage cans		4
Capacity of each	litres	8
Daily output of the freezer, approx.		100
Weight of the complete installation net:	485 kg	(1070 lb.)
gross:	810 kg	(1780 lb.)
Shipping volume:	3.85 m³	
	134 cu. ft	

The right is reserved to improve or modify any machine and change prices without notice.

It is the ambition of every confectioner to produce his ice cream very supple and soft and to be able to serve it at any time at the right temperature. With the Tatra-Delikata ice cream freezer this problem is automatically solved to the satisfaction of the proprietor. The freezing operation is carried out in the brine bath, in which the freezing can is submerged. Its capacity is 20 litres (approx. 5 gallons) and it is driven in clockwise direction by a 3 phase electric motor (½ HP) placed in the upper part of the body. The power is transmitted by V-belts. The temperature of the brine in the freezer compartment is automatically maintained at about 20 degrees centigrade below zero (minus 4 degrees Fahrenheit). It is essential that the mixture is well turned and stirred and that it does not adhere to the inside walls of the can. For this purpose our freezer is equipped with a double worm scraper rotating in the opposite direction against the can at a higher speed.

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MO 5121 a - 5701 - SCT 04 - 81304

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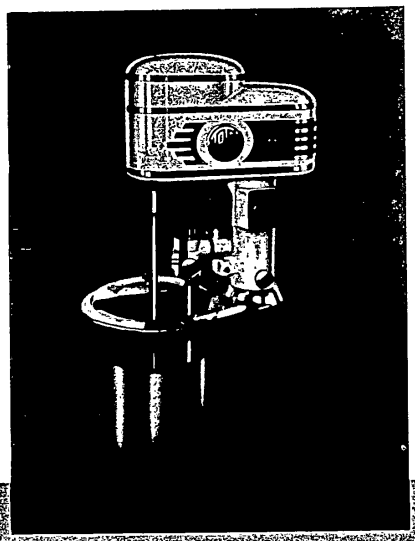

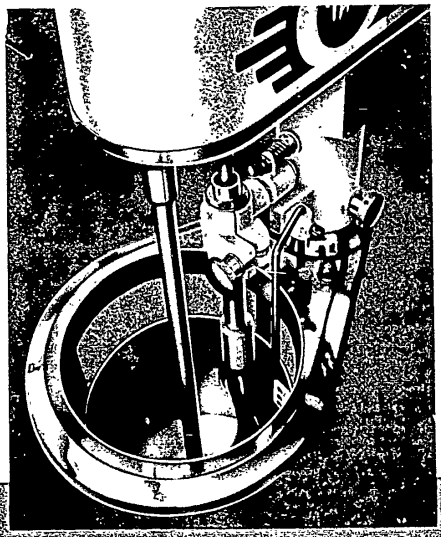

As the edges of the scraper continuously touch the inner wall of the freezer can, the mixture is worked very intensively, the contents swells and thus a very large overrun of delicious ice cream is obtained.

The finished products is of very fine taste and extremely smooth. The most advantageous amount of filling for each batch is approx. 3 litres (6 pints).

The emptying of the finished product is effected while the machine runs slowly, by means of celluloid or wooden blades 20×7 cm. The blades collect the ice cream and pass it to conserver cans.

The cabinet as shown has a marble top plate. The ice cream is placed in the cans each of about 8 litres contents, and the temperature of the brine around the can shells is maintained constantly at about 15° C below zero (+ 5 degrees Fahrenheit). On the left hand side of the counter a storage space of interior dimensions 490×660×625 mm (19 1/4 × 26 × 24 1/2 inches) is kept at a temperature of about 5° C (40 degrees Fahrenheit) for beverages, etc.

In cases where the customer wishes the Ice Cream Storage Cabinet itself to be built on the spot or supplied by local makers, we are prepared to deliver the motor driving device with the freezing can alone (see ill. p. 2).

The necessary quantity of the brine of 26° Be density is about 300 litres and will be procured by the customer on the spot. If solid brine powder is used, the mixing proportion for each 100 litres of brine is 36 kg of powder and 86 litres of warm rain water.

The counter with ice cream freezer is connected to an air or water condensing unit driven by a threephase 1 HP electric motor.

The temperature is maintcined automatically by means of a thermostat and automatic switch.

TECHNICAL DATA

Output of the electric motor to the freezer 0.75 HP

Output of the electric motor to the condensing unit 1 HP

Overal dimensions: length 195 cm

width 80 cm

height 90 cm

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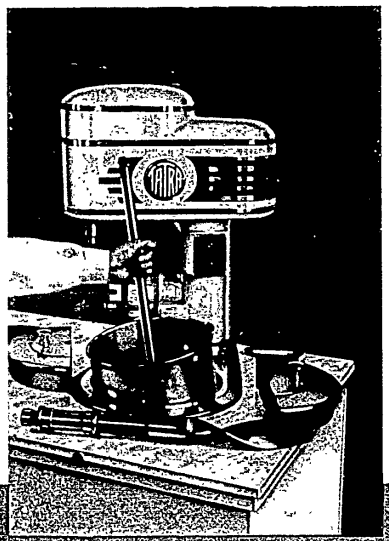


Capacity of the freezing can	litres	20
Number of storage cans		4
Capacity of each	litres	8
Daily output of the freezer approx.		100
Weight of the complete installation net		485 kg (1070 lb.)
	gross	610 kg (1780 lb.)
Shipping volume		3.85 m³
		134 cu. ft.

The right is reserved to improve or modify any machine and change prices without notice

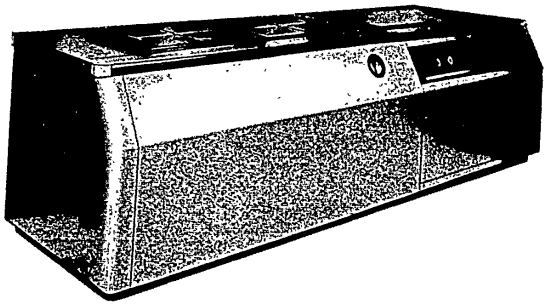
MOTOKOV

PRAHA CZECHOSLOVAKIA

MOTOKOV, ZAHR. OBCHOD. PODN.

Printed in Czechoslovakia

ELECTRO-AUTOMATIC LABORATORY DEEP TEMPERATURE COUNTER TYPE HC 125/20-60 AND 270/20-60 FOR WORKING TEMPERATURE UP TO - 60°C/-76°F/



APPLICATION:

For laboratorium and scientific test of material and products, for inspecting of measuring and control instruments at low temperatures and for aging of metals. In the freezing space an uniform temperature in the range between 20 and 60° C below zero is automatically maintained with a minimal difference of 2° C.

DESCRIPTION:

The body of the counter is of wood construction reinforced by a steel base frame and provided on all sides with insulation of 25 cm thickness. The exterior is covered by steel sheet white enamel sprayed.
The counter is built up as a complete independent deep freezing plant with built-in condensing unit. The left part is designed as freezing room, contrary to the right half concealing the machine. Before leaving the factory the installation undergoes severe tests, so that only the connecting to the main line and the water installation is necessary for making the counter ready for working.
The interior walls of the freezing room are provided with steel tubes in two layers forming the evaporator of the necessary capacity The bottom is protected by a fire galvanized steel grate. For introducing cables in the freezing room for driving instruments if necessary, in the left wall 4 passages are foreseen. The upper plate above the freezing space is in rust proof steel sheet provided with hinged insulated bakelite lids Underneath is a second set of sliding lids in order to make observation without excessive losses of temperature If necessary these second lids can be removed.
In the freezing room electric bulbs of 24 Volts are placed feeded through transformer Their switch is placed on the control panel of the counter.
The front wall is in its upper part bevelled, in order to facilitate manipulation in the interior
The condensing unit with all control and auxiliary instruments is placed in the right part of the counter

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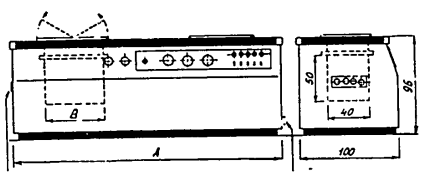
The condensing unit working with Freon — F 12 — is of two stage type, both compressors driven by a commun electromotor controled by automatic contactor. The normal working tension is threephase 380 Volts, 50 cy. The condenser is water cooled and to guarantee the full capacity the cooling water must be about 15° C at 3 atm. pressure. Here is also the distribution board with all electric appliances and other devices for automatic control of the machine. Interior light. The access to the machine room is through the side wall or through the top opening covered by a light lid. On the pertinax board are adjusted all switches, control thermometers for the freezing space and for checking temperature of the undercooled coolant, control pressure gauges for checking working pressures in the system and starting switches. Connections for water installation and current installation are provided in the right wall.

TECHNICAL DATA:

Size		HC 125/20-60	270/20-60
Capacity of the freezing space	liters	125	270
	galls	27	60
Load in kg per 24 hours		20	30
Exterior dimensions in cm: length A		278	350
width		100	100
height		98	98
in inches		109×39×38	137×39×38
Freezing room dimensions in cm: length B		60	134
height		40	40
width		50	50
in inches:		23×15×19	52×15×19
Condensing unit type		V 540 - V 526	V 680 - V 653
electric motor kW		3	4
water consumption 15° C — 3 atm. pressure per hour/liters		300	400
Weight net/gross	kg	1000/1350	1500/1800
	lbs	2200/2950	3300/3970
Packing	cm	300 125×120	370×125×120
	inches	118×49×47	145×49×47

Overall dimensions sketch.



Changes in construction reserved.

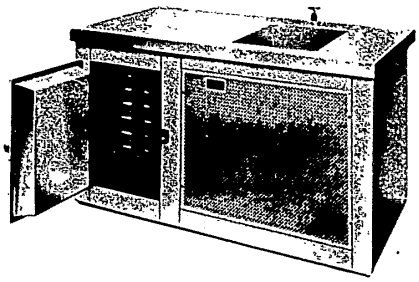
MOTOKOV PRAHA - CZECHOSLOVAKIA

038/MO a - 5704 - SČT 04 - 80332

Printed in Czechoslovakia

ICE CUBE MAKER TL 150

with built-in condensing unit



Overall dimensions:	lenght 120 cm – 47 inches width 80 cm – 31 inches height 85 cm – 33 inches
Exterior:	steel sheet, duco varnished
Interior:	zinc galvanized sheets
Topplate of the counter:	polished zinc galvanized sheet, with water basin for thawing-off the ice cubes and refilling of the trays. Water cock and overflow tube
Capacity:	approx. 120 kg ice/24 hours (265 lbs)
Number of ice trays:	14
Number of ice cubes in each tray:	27
Total capacity of each tray:	kg 2 – 4.5 lbs
Dimensions of ice cubes	cm 4.5×4.5×4 – 1.7×1.7×1.5"
Capacity of three-phase electric motor:	HP 1
Refrigerant:	CH_3Cl
Net weight approx.:	kg 400

DESCRIPTION

The condensing unit placed in the right part of the counter works automatically by means of a thermostat and is connected by tubing to the zinc metallised multiple plate evaporator of special design. The ice trays are placed directly on the evaporator in order to obtain perfect contact.

MOTOKOV LTD., PRAHA – CZECHOSLOVAKIA

MOTOKOV 5124 a - 5702 - SČT 01 - 80081

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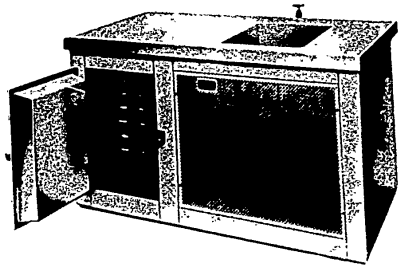
WÜRFELEISERZEUGER TYPE TL 150



Außenabmessungen des Pultes:	Länge 120 cm Breite 80 cm Höhe 85 cm
Außenbelag:	Eisenblech, Duco
Innenausführung:	verzinktes Blech-
Leistung bis kg:	120/24 Stunden
Anzahl der Schubladen:	14
Anzahl der Eiswürfel in jeder Schublade:	27
Inhalt jeder Schublade Liter:	2
Größe eines Eiswürfels:	4,5×4,5×4 cm
Antriebsmotor dreiphasig:	1 HP–0,75 kW
Kühlaggregat im Pult eingebaut	
Betrieb:	automatisch von einem Thermostaten geregelt
Kühlmittel:	Chlormethyl
Gewicht:	ca 400 kg

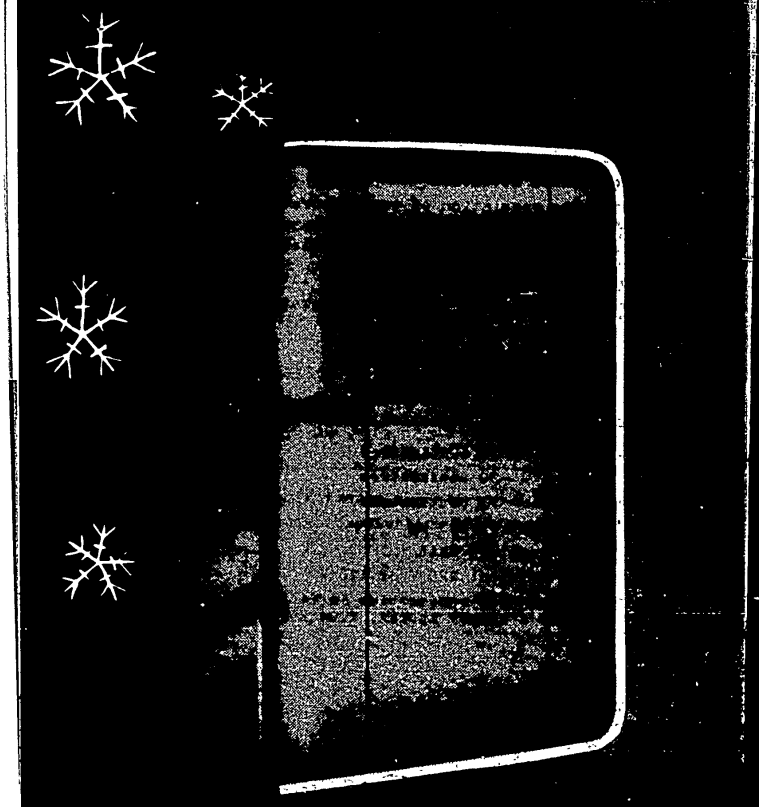
Der Erzeuger ist als Pult ausgeführt, in dessen linker Hälfte die Schubladen auf speziell ausgeführtem Verdampfer untergebracht sind.
Das Kühlaggregat befindet sich in dem rechten nicht isolierten Teile. Die obere Platte ist als Manipulationsfläche gedacht. Rechts befindet sich eine Wanne mit Wasserhahn, um die Schubladen zu füllen und unter dem Wasserstrahl abtauen zu lassen. Die Wanne ist außerdem mit Überlauf versehen.

MOTOKOV A. G. – PRAHA – TSCHECHOSLOWAKEI

MOTOKOV 5124 n - 5702 - SČT 04 - 80081

Gedruckt in der Tschechoslowakei

Elektrosit



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POOR ORIGINAL

E L E K T R O S V I T Absorption Type Household Refrigerator

Without motor

Quite noiseless

Requires no attention

Automatic regulation of temperature by means of a thermostat

Produces ice cubes even at an ambient temperature of 38°C

Volume of refrigerated space: 60 litres

Overall dimensions of the refrigerator:

Width	58 centimetres
Depth	64 centimetres
Height	102 centimetres

Dimensions of refrigerated space :

Width	38 centimetres
Depth	30 centimetres
Height	53 centimetres

Net weight 75/125 kg

Power input 80 Watt

Mains tension: 220 V or 120 V

Average power consumption in 24 hours (yearly average) approx. 2.04 KWh/24 h

D e t a i l s o f c o n s t r u c t i o n :

All-metal body

Careful insulation of all walls and doors with glass wool

Outer finish in white lacquer varnish

Inner walls white enamelled

Grills, ice trays and evaporator cover made of aluminium sheet

Electrically oxidized

A board type evaporator

2 ice-cube trays for 36 cubes

The ELEKTROSVIT absorption refrigerator can be supplied to operate on electric power
gas
kerosene

The manufacturers reserve the right zo make changes in construction and finish.

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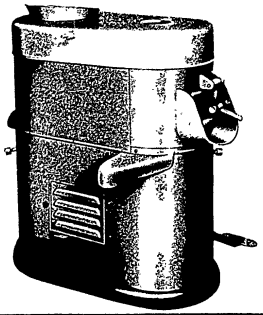


COMBINED ELECTRICAL POTATO PEELING AND WASHING MACHINE

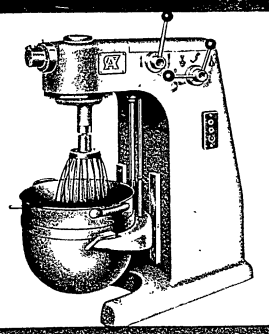
Application: Cleaning and peeling of potatoes and root-vegetables.

Design: Outer metal-sheet casing. The washing device is located in the rear part of the machine and consists of the rotating washing bottom. The second part is designed as a peeling device with a carborundum disc and a carborundum lining on the inner surface of the machine. The drive by a common electric motor and V-shaped belt, the selection of the one or other device being controlled by a foot pedal. The machine is connected to the water main. The filling basket leads into the washer. The individual charges are emptied through the door at the front of the machine.

Technical data:

	Size KSP 180
Overall Dimensions	cm 105×63×112 (inch. 41×24.8×44)
Capacity per hour	kg 180 (lbs 396)
Motor	kW 0.55
Weight net/gross	kg 220/260 lbs 485 570

	Size KSP 400
Overall Dimensions	cm 124×53×114 (inch 48.8×24.8×44.9)
Capacity per hour	kg 400 (lbs 880)
Motor	kW 1,1
Weight net gross	kg 270 320 lbs 595'705



UNIVERSAL KITCHEN MIXER TYPE S 2 WITH AUTOMATIC BOWL LIFTING

Indispensable in larger kitchen plants. The universal kitchen machine mixes and kneads dough and whisks eggs, cream, mayonnaise etc. It processes various materials by means of auxiliary attachments, supplied upon request, saving in this way much time and enormous amount of work.

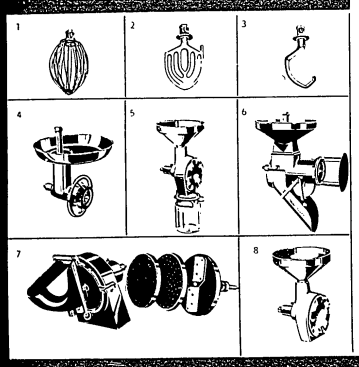
The machine is driven by electric motor placed in the base through V-belts and three speed gear box.

The beating tools have a combined planetary motion not only around its own axis, but also round the periphery of the bowl.

The vertical movement of the bowl is carried out automatically from the motor and controlled by end stops. The auxiliary attachments are fixed in the front of the machine.

The normal equipment of the machine includes two bowls of 60 and 30 litres each in steel sheet tinned with 3 beaters — wire, flat and hook type Stainless steel execution upon request.

Overall dimensions	cm 80 57×112 — 31×22×44 inches
Capacity of the electric motor	HP 1,5
Weight net/gross	kg 370 440 815 970 lbs



EQUIPMENT AND AUXILIARY ATTACHMENTS

Beaters
1 wire
2 flat
3 hook

Attachments on special order
4 meat mincer Ma
5 coffee mill KA
6 strainer PAV
7 grinder and slicer US
8 poppy seed mill Mm 20

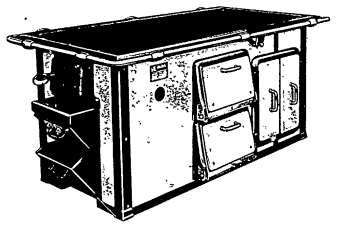
All weights and dimensions data approximative only

Changes of design and execution reserved.

MOTOKOV

PRAHA - CZECHOSLOVAKIA

LARGE KITCHEN EQUIPMENT



RESTAURANT RANGES

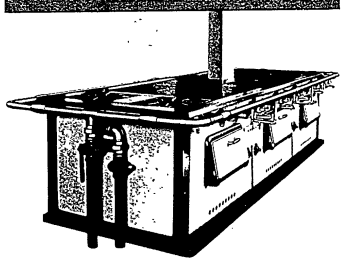
Application: Boiling and baking of all sorts of food.
Outstanding Features: Instantaneous heat, easy regulation.
Design: Rigid construction suitable for heavy duty service. The outer walls are white-enamel finished, the fittings are enamelled or galvanized

A. COAL RANGES – SU

Removable rings in the front plates for the purpose of achieving instantaneous heat. Every cooker is provided with a warming compartment and two or four baking ovens, respectively (SU III).
The inside of the range is lined out with fire-bricks.

TECHNICAL DATA:

Type	Overall dimensions cm	Overall dimensions inches	Weight net/gross kg	Weight net/gross lbs	Dimensions of Baking Ovens cm	Dimensions of Baking Ovens inches
SU 1	190x103x83	74,8x40x32	550/630	1210/1390	70x40x47,5	27x15x18
SU 2	222x112x86	87x44x33	780x880	1770/1940	82x60x24	32x15x9,5
SU 3	256x130x86	100x51x33	1060-1300	2390/2860	107x50x24	40x19x9,5



B. GAS RANGES SP

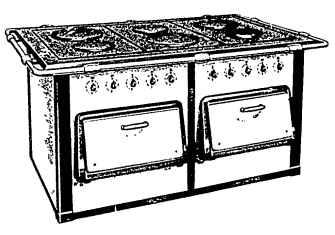
Covered plates or open burners for warming with open flame according to the following specification

Type SP IV operates with compressed air in order to achieve higher temperatures for which reason it is equipped with an electric-motor driven compressor The oven is fitted with doors on both sides

	Total dimensions cm	Total dimensions inches
TYPE SP II	265x156x86	104 61x33
TYPE SP IV	371x152x86	146x59x33

	Number of burners open	Number of burners closed	Gas Consumption cubic m hour	Dimensions and Number of Baking Ovens cm	Dimensions and Number of Baking Ovens inches
SP II	2	6	18	50x24x110	19x9, 4x43
SP IV	2	10	24	50x24x110	19x9 4x43

Type SP II weight net gross kg 875/975, lbs 1930 2150
Type SP IV weight net gross kg 1600/1800, lbs 3520 3970



C ELECTRIC RANGES SE 1

5 circular plates, each controlled by a three heat series-parallel change-over switch Each of the two ovens is equipped with heating elements at the bottom as well as on top, and two change-over switches The outer walls are enamel-finished, the fittings are enamelled or chromumplated.

Number of plates 3 Ø 300 mm, dia 11
Number of plates 3 Ø 220 mm, dia 8,6
Number of ovens 2 50 × 24 cm, 19,6 × 9,4
Overall dimensions of the Electric Range

cm	inches
167 112	63 × 42
in plates 144 80	57 31

Input kW 23
Weight net gross 425 515 kg. 735 925 lbs

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STEAM BOILING KETTLES

Application:

Cooking soups, sauces, meat, vegetables, potatoes, dumplings, milk, coffee.

Design:

Double jacketed inside, the space between the jackets is filled with a water bath by the boiling of which the foods are being heated up without coming into contact with the walls exposed to direct heat. The inner coat is of an enamelled steel sheet, the outer walls are white enamelled. The lid in enamelled and equipped with a counterweight to ensure any position. Every kettle is provided with a safety valve, an inlet tap, an outlet tap and a pressure gauge for steam heating. Stainless steel execution of the inner liner and the lid upon application

Heating:

steam at 0,3 atm. pressure,
gas,
electrical current,
coal.

Dimensions of the inner liner

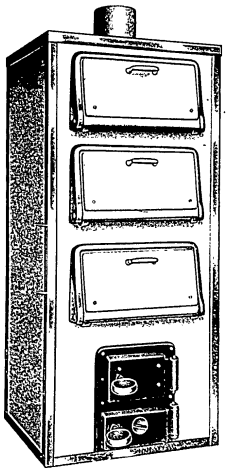
Size	litres	150	300	Imp. gal	33	66
dia	mm	700	900	inches	27,5	35,4
depth	mm	450	700	inches	17,7	27,5

Overall dimensions of the kettles approx.

	mm	950	1050	inches	37	41
	mm	1150	1100	inches	45	43

Consumption of steam	kg h	60	120	lbs h	132	264
gas	m^3 h	5	9	cu ft h	176	317
electric current	kW h	10	38			

Time of boiling 30 minutes
Weight steam heated net gross kg 210/270 280 360 lbs 460 565 615 790



THREE OVEN ROASTING CABINET T 3

Application: For baking puddings, cakes, pastry, meat, fowl.
Design: Outer walls covered by a white enamelled metal sheet casing, chromium plated sectional iron Three ovens in threedeck arrangement. Their doors are heat-insulated and balanced The inside is provided with sectional irons for the eventual insertion of a further baking plate. The gas ovens are heated from the bottom as well as from the top while the intensity of heat in both places can be adjusted according to the respective sort of pastries, which is especially important when making fancy pastries With the ovens, it is possible to order a stand for baking plates to be placed at the flank of the oven The stand is an iron construction and has 11 shelves for the baking plates.
The heat intensity of the coal type is regulated by the small lower door Fire clay plates for lining the interior of the furnace will be shipped separately

Technical data:

Overall Dimensions		TU 3 Coal	TP 3 Gas
	cm	80 80 180	86 80 180
	inches	31×31×70	33 35×70
Inside Dimensions			
	cm	50×24×80	50 24×70
	inches	20 9,4 31	20×9,4×27,5
Consumption per hour			4 m^3
			141 cbft
Weight net gross	kg	835 920	600 680
	lbs	1840/2020	1320 1500

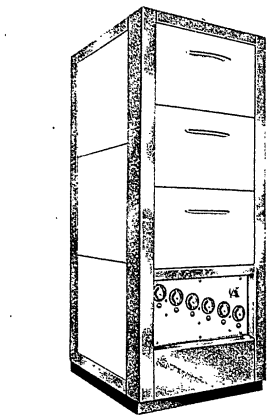
THREE COMPARTEMENT BAKING CABINET ELECTRICALLY HEATED TE 3

The execution and using of the type is identical to the precedent types. Each baking compartment is provided at the top and at the bottom with separate heating elements, each consisting of 5 rods. Both the tops and bottom elements are switched on and controlled by individual 4 working position switch of 500, 1200 and 2000 Watts input
Stands for baking tins are to be ordered separately

The roasting cabinet is normally provided for working tension three-phase 3×380 V, 50 cy. Upon application the heating elements can be adjusted for three-phase tension 3×220 Volts or for D. C. 110 V or 220 Volts Each cabinet should be carefully earthed

Technical data:

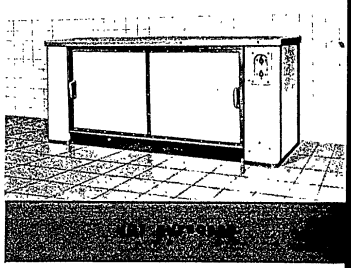
Overall dimensions	cm	90×86×180	– 35×33×70"
Baking space dimensions	cm	50×24×70	– 19×9×27'
Input	kW	12	
Weight net gross	kg	420 510	925 1125 lbs



HOT CUPBOAD ELECTRICALLY, GAS OR STEAM HEATED.

The top plate in heavy bright mild steel polished. The interior is divided by perforated plate in the middle in two parts.
exterior white enamelled Sliding doors on both sides

Overall dimensions				Consumption		
length	cm	190	inches 74	steam	kg	10
width	cm	80	inches 31	gas	m^3	1,5
height	cm	85	inches 33	current	kWh	4



TILTING FRYING PANS

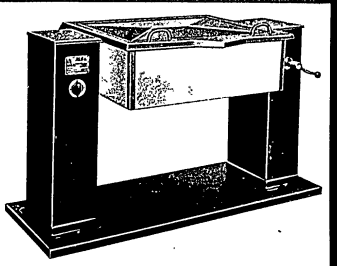
Application: Frying of fish cutlets, doughnuts, etc

Outstanding Features: Saving of fat, great efficiency, continuous service, easy cleaning

Design: Strong side walls, tilting of the pan by a hand crank, heat regulation, drop-down lid

Technical data.

	Gas PP1	Electrical Current PE 1
Input	3 m^3 h	10 kW
Capacity of the pan	86 litres, 19 Imp. gal	
Overall dimensions	cm	inches
	160 74 88	63 29×34.6
Weight net gross	330 390 kg	730 860 kg



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THE FAMOUS CZECHOSLOVAK ENAMELWARE

THIS LEAFLET DEPICTS ONLY THE SHAPES OF GOODS. REGARDING COLOURED DECORS APPLY FOR A SPECIAL PROSPECTUS.

MOTOKOV PRAHA-CZECHOSLOVAKIA

MO 333 5611

Printed in Czechoslovakia

ALUMINIUM KITCHEN UTENSILS

USTENSILES DE CUISINE EN ALUMINIUM

KÜCHENGESCHIRR AUS ALUMINIUM

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THE FAMOUS CZECHOSLOVAK ENAMELWARE

ART. No 801; 10-26 cm
STRAIGHT STEWPAN with cover
CASSEROLE avec couvercle
KASSEROLLE mit Deckel

ART. No 803
MILK CAN
BIDON A LAIT
MILCHKANNE

ART. No 806; 9 cm
SOUP STRAINER
PASSOIRE A POTAGE
BOUILLONSIEB

ART. No 805
DINNER CARRIER - 3 PARTS
PORTE-ALIMENTS - 3 COMPARTIMENTS
SPEISENTRAGER - 3 TEILE

ART. No 804
DINNER CARRIER - 2 PARTS
PORTE-FRICOT - 2 COMPARTIMENTS
SPEISENTRAGER - 2 TEILE

ART. No 800; 10-26 cm
STRAIGHT POT with cover
MARMITE HAUTE avec couvercle
GERADER TOPF mit Deckel

ART. No 807
WATER BOTTLE
GOURDE
WASSERFLASCHE

ART. No 802; 21
MILK SAUCEPAN
CASSEROLE LAIT
MILCHPFANNE

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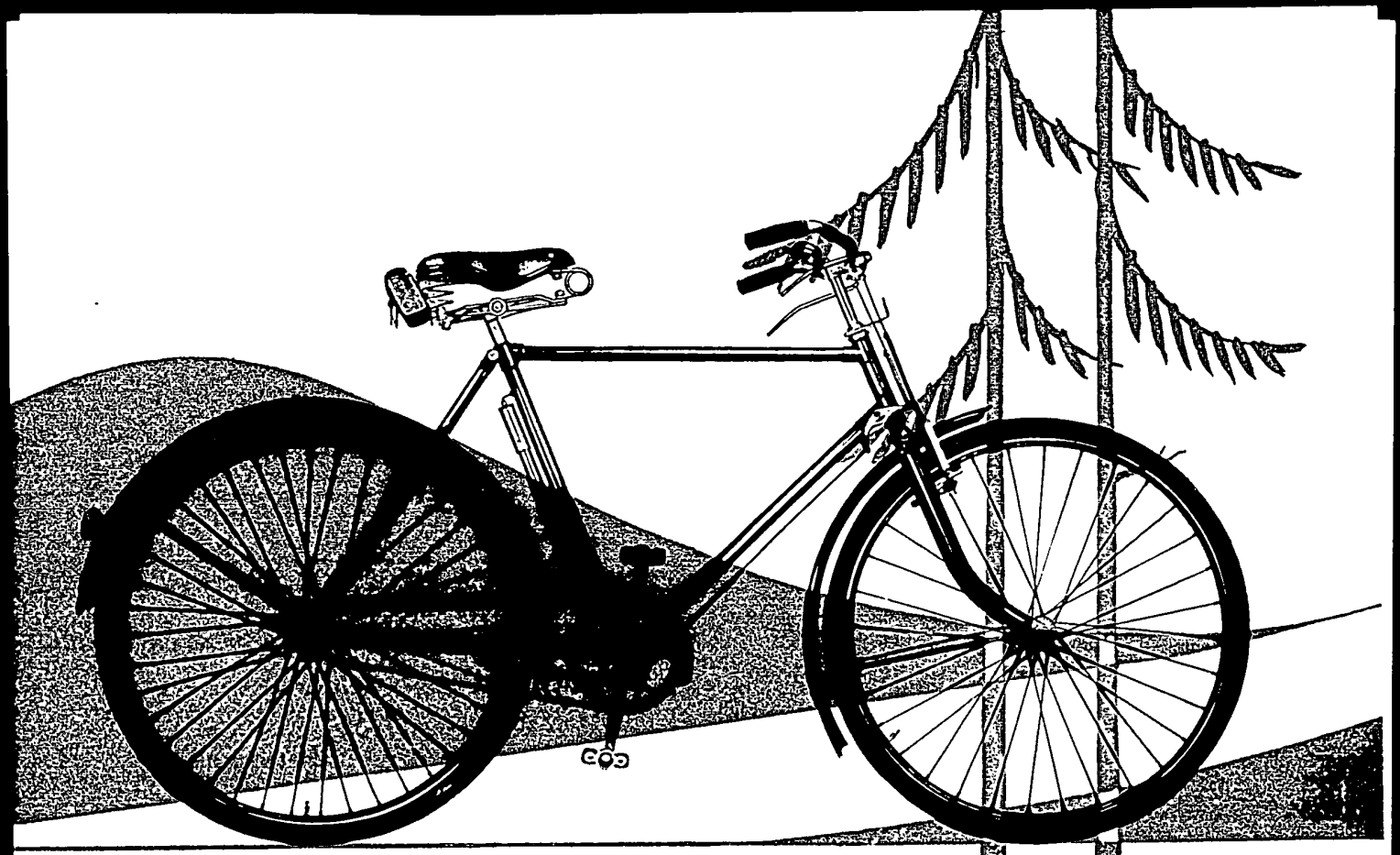

TOURING BICYCLE FOR GENTLEMEN MODEL Tp 4 — "ROADSTER"

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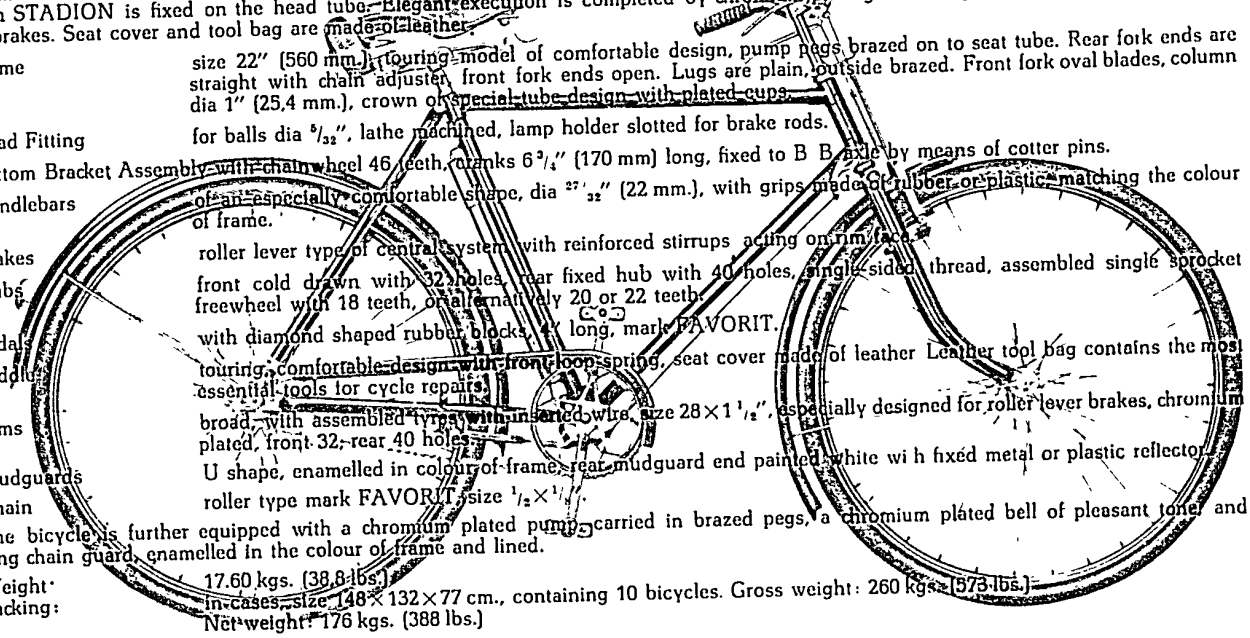
Touring Bicycle for Gentlemen Model Tp 4 – "ROADSTER"

For discriminating riders, who require the very best execution, safety, and light rolling bicycle. Its construction, and shape of handlebars, ensure the highest possible riding comfort, roller lever brakes with reinforced stirrups, central system, offer absolute safety, and the rear hub with single-sprocket freewheel a light, positive riding, which is especially noted on level roads.
Frame with front fork are enamelled in black or colour enamel with double lines. The main down tube bears transfer ROADSTER A shield with STADION is fixed on the head tube. Elegant execution is completed by chromium plating of all bright parts including rims, parts of brakes. Seat cover and tool bag are made of leather.



Frame	size 22" (560 mm.), touring model of comfortable design, pump pegs brazed on to seat tube. Rear fork ends are straight with chain adjuster, front fork ends open. Lugs are plain, outside brazed. Front fork oval blades, column dia 1" (25,4 mm.), crown of special tube design with plated cups.
Head Fitting	for balls dia $^{5}/_{32}$", lathe machined, lamp holder slotted for brake rods.
Bottom Bracket Assembly	with chainwheel 46 teeth, cranks $6\,^{3}/_{4}$" (170 mm) long, fixed to B B axle by means of cotter pins.
Handlebars	of an especially comfortable shape, dia $^{27}/_{32}$" (22 mm.), with grips made of rubber or plastic matching the colour of frame.
Brakes	roller lever type of central system with reinforced stirrups acting on rim face.
Hubs	front cold drawn with 32 holes, rear fixed hub with 40 holes, single-sided thread, assembled single sprocket freewheel with 18 teeth, or alternatively 20 or 22 teeth.
Pedals	with diamond shaped rubber blocks, 4" long, mark FAVORIT.
Saddle	touring, comfortable design with front loop spring, seat cover made of leather. Leather tool bag contains the most essential tools for cycle repairs.
Rims	broad, with assembled types with inserted wire, size $28\times1\,^{1}/_{2}$", especially designed for roller lever brakes, chromium plated, front 32, rear 40 holes.
Mudguards	U shape, enamelled in colour of frame, rear mudguard end painted white with fixed metal or plastic reflector.
Chain	roller type mark FAVORIT, size $^{1}/_{2}\times\,^{1}/_{8}$".

The bicycle is further equipped with a chromium plated pump carried in brazed pegs, a chromium plated bell of pleasant tone and long chain guard, enamelled in the colour of frame and lined.

Weight:	17.60 kgs. (38,8 lbs.)
Packing:	in cases, size 148×132×77 cm., containing 10 bicycles. Gross weight: 260 kgs. (573 lbs.) Net weight: 176 kgs. (388 lbs.)

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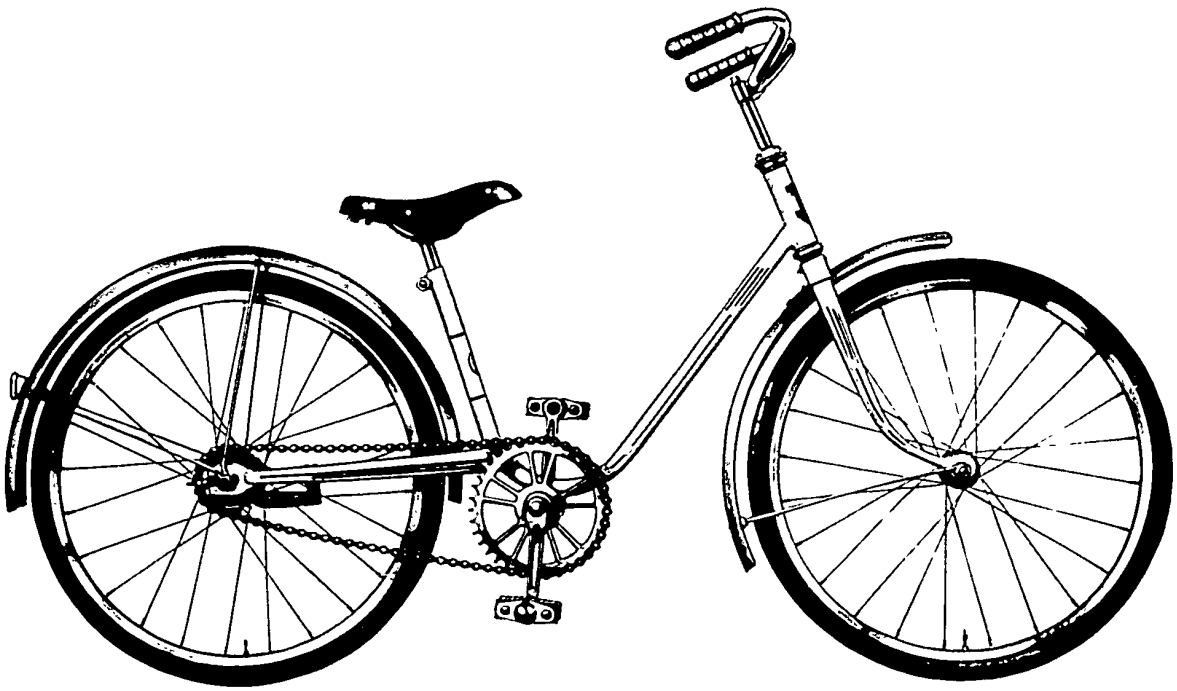
P 3 "START"

CHILDREN'S BICYCLE FOR THE SMALLEST ONES



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P 3 "S AR " Children's Bicycle for the Smallest Ones

The selection of bicycles of all available models actually starts with this one, which is the most suitable sports gift both for boys and girls aged 3 to 6. Its construction is safe, reliable and sturdy, and for some of its parts use is made of light alloys. The frame and front fork are enamelled in pastel colours with 3 lines on the head tube and rear fork blades The head tube bears a "START" name plate

Bright parts are chromium plated and the seat cover is made of genuine light tan leather

Frame	285 mm high, single tube design, duly reinforced, dia 22 mm, rear fork stay-less, fixed to cradle type tube by means of special lug Rear fork ends are straight, front fork of a special design for children column dia 22 mm
Head fittings	designed for children, retainers with balls dia $^{5}/_{32}$"
Bottom bracket	assembly with chainwheel, 35 teeth, cranks 105 mm long, fixed to B B axle by means of cotter pins
Handlebars	of touring shape, bent slightly, children's execution, tube dia 18 mm with grips of rubber or plastics matching the colour of frame
Front hub	cold drawn with 24 holes.
Rear hub	coaster (with back pedalling brake) with 24 holes, fixed sprocket with 18 teeth
Pedals	with pressed rubber blocks, narrow, children's design
Saddle children's	design of genuine light tan leather
Rims	made of steel or duraluminium, 28 mm broad for 18" pneumatic tyres, with 24 holes
Mudguards	made of duraluminium or steel, 50 mm broad, rear mudguard with a double stay, fixed rear reflector made of metal or plastics
Chain	roller type, VELO brand size $^{1}/_{2} \times {}^{1}/_{8}$"
Tyres	with inserted wire size 18" × $1^{1}/_{4}$"

The bicycle is further equipped with a chromium plated bell with a pleasant tone and the rear fork has a pair of easily operated chain adjusters.

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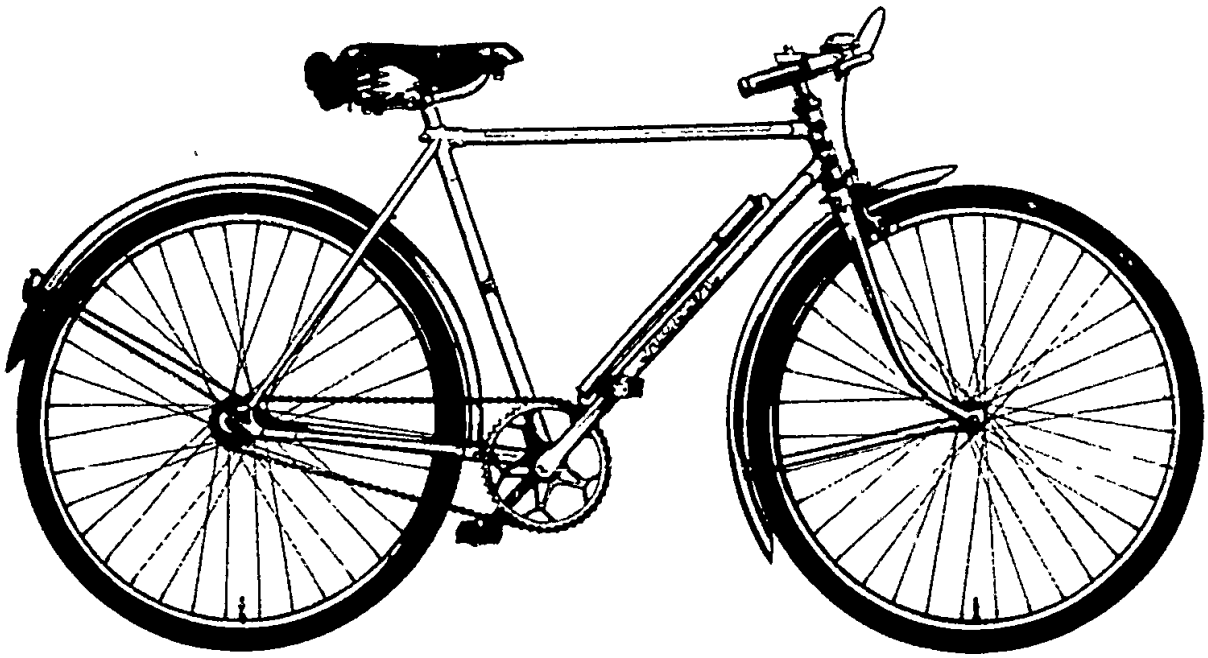
JUNIOR BOYS BICYCLE MODEL Sp 10



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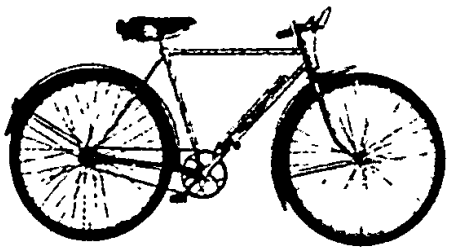

JUNIOR BOYS BICYCLE MODEL Sp 10

Sports bicycle especially suited for juveniles' touring. Its easy operation ensures comfortable riding even in hilly terrain. The use of light metal alloys decreases the total weight of the machine thus increasing the comfort of riding for its user

Frame is colour enamelled as well as the front fork, and decorated by double lines and coloured head tube. The main down tube bears JUNIOR transfer, seat tube bears a sleeve ESKA - SPORT transfer, the head tube a ESKA - JUNIOR metal name plate.

All bright parts are chromium plated with high lustre, seat cover and tool kit are made of light-tan genuine leather

Frame 20" high (510 mm), outside brazed, made of precision tubes dia 26 ($1^{1}/_{32}$") and 28 mm ($1^{7}/_{64}$"). Lugs are cut-away, rear fork ends bent. Main down tube bears welded pump pegs.

Front fork of sports type with column dia 25,4 mm (1.–") is made of seamless cold drawn tube, ends open.

Head fitting pressed, with retainers with balls dia $^{5}/_{32}$".

Bottom bracket assembly cotterless, cups screwed in, L. H. cup with safety lock ring, retainers with balls dia $^{1}/_{4}$", cranks $6^{1}/_{2}$" long (165 mm), chainwheel 46 teeth.

FAVORIT chain roller type $^{1}/_{2} \times {}^{1}/_{8}$" 104 links.

Pedals touring type, $3^{1}/_{2}$" long, with drawn rubber blocks.

Hubs - front with 36 holes, made of steel, rear coaster hub with 36 holes and sprocket either 18 or 20 teeth, hexagonal nuts.

Rims made of steel with 36 holes for tyres 26 x $1^{1}/_{2}$" W. O.

Brakes - front caliper rim brake, polished, lever as well as clamp made of steel. Rear Coaster hub brake.

JUNIOR saddle with leather top and leather tool kit, containing an oil can and auxiliary tools.

Mudguards 50 mm ($1^{3}/_{32}$") broad, made of polished duraluminium. ESKA transfer on mudguard. Rear mudguard is equipped with a prismatic glass rear reflector in duraluminium frame.

Cycle pump made of steel with extension.

Bell single tone, chromium plated.

Weight 14,20 kg (31 lb).

Handlebars made of duraluminium, straight, dia of tubes 22 mm, polished, fixed to adjustable steel stem. Handlebar grips made either of rubber or plastic in neutral colour.

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PUGWASH CONFERENCE

OF INTERNATIONAL SCIENTISTS
ON
BIOLOGICAL AND
CHEMICAL WARFARE

PUGWASH, NOVA SCOTIA, CANADA

AUGUST 24-30, 1959

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PREFACE

This volume contains the communications of the Pugwash Conference of International Scientists on Biological and Chemical Warfare, along with lists of those who participated in or were otherwise associated with the Conference.

The Statement that was issued by the Conference at the conclusion of the final meeting appears as the first document in the volume.

To enable the speedy dispatch of the Conference papers to the governments of the world, the volume is being published in Pugwash by the Secretariat during the days immediately following the Conference.

Betty Royon
Director of the Pugwash Secretariat

Pugwash, Nova Scotia, Canada
August 31, 1959

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Statement of
Pugwash International Conference of Scientists
On Biological and Chemical Warfare

The fifth in the series of Pugwash Conferences of scientists, aimed at assessing the dangers to humanity arising from developments of modern science and technology, has met in Pugwash, Nova Scotia, from August 24 - 29, as guests of Mr. Cyrus Eaton. The twenty-six scientists from eight nations attending the Conference were:

Dr. Brock Chisholm, Canada
Professor Claude E. Dolman, Canada
Professor Donald Kerr, Canada
Sir Robert Watson-Watt, Canada
Dr. Freben von Magnus, Denmark
Dr. André Lwoff, France
Dr. Pierre Thibault, France
Dr. M. L. Ahuja, India
Academician Mikhail M. Dubinin, Soviet Union
Professor Alexandre A. Imshenetsky, Soviet Union
Mr. Vladimir P. Pavlichenko, Soviet Union
Professor A. A. Smorodintsev, Soviet Union
Professor Sven Gard, Sweden
Mr. F. C. Bawden, United Kingdom
Dr. Patricia J. Lindop, United Kingdom
Professor Gordon Manley, United Kingdom
Professor Joseph Rotblat, United Kingdom
Professor M. G. F. Stoker, United Kingdom
Professor H. Bentley Glass, United States
Dr. Charles C. Higgins, United States
Dr. Martin M. Kaplan, United States
Professor Chauncey D. Leake, United States
Professor Hugo Muench, United States
Professor Eugene Rabinowitch, United States
Professor Alexander Rich, United States
Professor Theodor Rosebury, United States

The purpose of the Conference was to assess the potentialities of chemical and biological agents as weapons, and to explore possible means for preventing their production or use in war.

The subject of chemical and biological warfare has been shrouded in official secrecy. For years large projects have existed in several countries

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with the stated purpose of developing defense means against such weapons. We have no direct information about the results of these projects, but inevitably they increase the efficiency and destructiveness of various types of biological and chemical weapons, and result in the development of new techniques. Judging from the number of technical workers involved in such projects and the money expended, much knowledge related to the production and delivery of micro-organisms for war purposes has probably been gained. Moreover, unsupported statements appear which suggest that such weapons have enormous lethal or incapacitating effects against man, can destroy plants and animals, and have advantages under certain conditions of war. Recently a concerted effort appears to have been made to suggest that these weapons are more "humane" than other means of warfare.

We have discussed the general nature of such weapons as well as the properties of the individual agents and their methods of delivery, and have compared them with other weapons. Our discussions suggest that the difficulties of establishing a stable and lasting peace are aggravated by the fact that all nations, whether or not they possess nuclear weapons, might produce biological and chemical weapons; international tension would consequently be increased.

Potentialities of Biological and Chemical Weapons

Biological weapons - microbes, viruses and their toxic products - can be delivered and dispersed in such a way that fatal or incapacitating diseases might be produced over large areas. They can be produced cheaply on a significant scale, even in a country whose technological development is not highly advanced. Such weapons could be used either alone or together with others. The attack could be local or massive or could consist of individual acts of sabotage. The agent could be selected to cause a great many primary casualties, or to initiate epidemics.

Infective agents or toxins used as biological weapons would presumably have the following characteristics: (a) lethal or incapacitating when applied in small amounts; (b) remain potent when stored or dispersed; (c) the diseases they produce should not be preventable by simple sanitary precautions, or by customary practices of immunization; (d) neither the agents themselves nor the diseases they produce should be easily identifiable; (e) the diseases they produce should not be curable by customary drugs or antibiotics. Many well-known biological agents possess several or all of the foregoing attributes. The simultaneous use of two or more pathogenic organisms might assist the spread of infection and confuse diagnosis.

Highly virulent strains of some pathogenic agents can easily be selected, as can strains of virulent bacteria resistant to all usual antibiotics, drugs and to

some disinfectants. Recent advances in microbial genetics make it possible to produce variants, some of which may be even more suitable for biological warfare than naturally occurring strains.

Quantitative information on the infectivity and toxicity for man of biological agents that might be used as weapons is too meager for their effects to be compared at all accurately with those of nuclear weapons. However, a surprise attack on a city might in time cause numbers of casualties approaching those caused by a small atomic bomb. An attack with an infective agent, originally meant to be localized, might lead to an epidemic because of abnormal routes of delivery, the large number of primary casualties, or the disorganization of public health.

The meteorological and other conditions required for biological or chemical attacks on man are so exacting that the military effects will be far from certain. The necessary conditions for a successful attack might prevail only on some days and at limited times of the day, and could be subject to the errors of meteorological forecasting. The discharged material, instead of moving into and staying in the intended area, might recoil on the aggressor. Biological weapons would presumably be stabilized to withstand exposure to the atmosphere and so might remain active for long periods and ultimately fall anywhere.

Attacks on economically useful animals are subject to many of the same limitations as attacks on man. The most likely use of biological warfare on animals would be to disrupt the economy, which could be done by introducing various infections that spread very rapidly, and some of which are transmissible to man.

There are also agents that could be used to destroy crops, but their effects are unlikely to be important compared with attacks on human beings and animals. Chemicals such as plant hormones would produce the quickest and perhaps the most serious results, but to be effective would have to be applied over great areas. Some infectious diseases of plants could also be damaging, and their introduction could adversely affect the economy of a region for a long time; but most spread too slowly to influence the outcome of a war.

Chemical weapons ("poison gas" or other poisonous substances) were used in the first World War and on several subsequent occasions. In recent years new poisonous substances have been produced which are many times as active as the earlier agents. Means for their bulk production have also been improved, as have procedures for their dissemination over areas very much larger than those covered during chemical attacks in World War I. The production of chemical warfare agents could easily be disguised as peacetime chemical industry, or such industry could be quickly converted to produce them.

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The so-called nerve gases, which are chemically similar to certain insecticides, are extremely potent and cheap, and cannot easily be countered with effective defensive measures. Masks and appropriate clothing can partially protect against them, but it is difficult to apply such protection to large populations; and it is unlikely that nerve gas casualties could be treated with antidotes soon enough after an attack to prevent serious consequences. New types of hallucinating agents or of poisons that give rise to transient mental disorganization, without recognizable permanent injury, have been advocated as means of "humanizing" war. Although they do not kill directly, their use could have serious consequences, because individuals or groups of people exposed to them behave unpredictably and often irresponsibly. The extremely high level of toxicity of new types of poisonous materials, as well as the means available for their delivery, permit their effects to be compared with those of certain types of atomic weapons.

Summarizing the previous paragraphs, biological and chemical agents clearly represent considerable additions to modern arsenals. Yet, we realize that nuclear weapons, particularly modern hydrogen bombs, have a destructive power several orders of magnitude greater than chemical or biological weapons. As means of immediate and certain destruction, these weapons cannot compare with hydrogen bombs. The dependence of biological weapons on uncontrollable factors, such as meteorological conditions, and the difficulty of confining the effects to the attacked territory, make them especially unpredictable in scope and effect.

World-wide apprehension about biological and chemical weapons can be allayed only by measures tending to assure that they will not be produced or used. But, however difficult the international control of atomic weapons may be, the international control of biological and chemical weapons by any system of inspection seems incomparably more difficult.

The first reason is that the specific weapons, or combinations of weapons, likely to be used in a particular instance cannot be foreseen.

The second is that chemical or biological weapons can be selected and prepared in ordinary chemical or microbiological laboratories. The fact that no elaborate or large-scale facilities are needed makes it difficult to identify possible places of preparation for biological or chemical warfare. Even elaborate installations would resemble those normally used in vaccine or antibiotic production. It follows that small and large nations, whether industrially undeveloped or highly industrialized, might secretly prepare to use such weapons; and with each added nation possessing such capabilities, the danger of war would mount.

A third reason is that means of dispersal of chemical and biological agents of warfare are diverse, including planes, submarines and missiles, as well as saboteurs. Their delivery therefore cannot be prevented because it would require a ban on all forms of transport, civil as well as military.

If control by inspection is so extremely difficult, what alternative ways are there to decrease the danger that chemical and biological weapons will be used? It seems clear that international renunciation of the use of such weapons, as in the 1925 Geneva Protocol, cannot allay apprehension unless all nations, small as well as large, ratify such an agreement without reservation. This is the first necessary step.

Secrecy is clearly essential to preparations for biological and chemical warfare. On the one hand, it enables any nation planning aggression to depend upon the element of surprise, and upon the opponent's lack of effective counter measures taken in advance. On the other hand, the unknown is, of itself, a potent cause of human anxiety, and is even more so when associated with weapons of any kind. Any actual danger there may be will certainly be exaggerated wherever information about any aspect of the situation is denied. Secrecy on the part of possible enemies is even more productive of anxiety, suspicion and hostility, and may precipitate hostile reactions. Free and frank revelation of all scientific and technical developments is essential to a degree of mutual trust necessary to resolve the acute tensions that now plague the world.

The most hopeful approach to international regulation therefore seems to comprise (a) a general agreement to prohibit the use of such weapons, and (b) the renunciation of official secrecy and security controls over microbiological, toxicological, pharmaceutical and chemical-biological research.

In considering how to implement the second of the foregoing proposals, we note the already excellent effects of the Report of the U.N. Scientific Committee on the Biological Effects of Radiation. A comparable scientific committee, or a permanent U.N. Scientific Commission on biological and chemical modes of warfare, could help to dispel apprehension. A subsidiary function of either group might be to investigate impartially the claims by plaintiff nations that others had openly or surreptitiously used methods of biological or chemical warfare against them.

The very existence of such a Commission might in time arouse the conscience of the individual scientists of all nations, the only ultimately effective safeguard against violations.

In agreement with the Third Pugwash Conference in Vienna, we repeat that, in the end, only the absolute prevention of war will preserve human life

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and civilization in the face of chemical and biological as well as nuclear weapons. No ban of a single type of weapon, no agreement that leaves the general threat of war in existence, can protect mankind sufficiently. We therefore must look forward to a day when the preservation of peace will transcend the ambitions of individual nations.

Trust between nations cannot be established by proclamation, but only by experience, particularly by experience in cooperative work towards common aims. There is already an extensive interchange of scientific information and people in the sciences basic to the problems discussed in this statement. We must build on this. The Commission proposed to collect and evaluate information bearing on chemical and microbiological warfare should serve not only to allay the fears of mankind that new and ever more horrible weapons of such types will be invented, but further to dispel the miasma of secrecy that fosters international suspicion and tension, and in its place to extend the benevolent application of microbiological and chemical knowledge for the benefit of all men.

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The Earl Russell (Great Britain)
August 24, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare 0.1

OPENING ADDRESS

I very much regret that I could not come to Pugwash to open your meeting in person, but I am glad to be able, through this medium, to greet you and to say a few words of welcome.

The present meeting, the fifth in the series of Pugwash Conferences, is different in some ways from the others. At previous meetings our main concern was the dangerous situation that has arisen from the development of nuclear weapons, and most of the participants were therefore nuclear physicists. Your meeting deals with a biological subject, and most of you are specialists in the live sciences. Despite, however, the difference in topic, the spirit of Pugwash remains the same.

You will recollect that the Pugwash movement originated from a letter signed by the late Albert Einstein, nine other scientists and myself, in which we drew attention to the dangers which would face humanity if another world war were to break out. This letter stressed the need for competent scientists, representing a wide range of opinion, to assemble in conference and to make a true assessment of the dangers.

The first Conference, which was made possible thanks to the generosity of your host, Mr. Cyrus Eaton, took place in the very town in which you are now, Pugwash, Mr. Eaton's birthplace. This first Conference has not only fulfilled all its objectives, but has also laid the foundations for the Pugwash movement; a movement which has become the symbol of the scientists' conscience, of the realization of his responsibility towards mankind; a movement which has received a wide measure of support from the scientific community all over the world.

The principal aim of the first meeting was to make an independent and objective assessment of the dangers arising from the existence of nuclear weapons. Since then the nature and extent of these dangers, both from a full scale war and from test explosions, have been generally recognized and appreciated by the governments concerned. The next task for scientists was to try to make a contribution towards diminishing these dangers, and this preoccupied us during the three following Conferences, at Lac Beauport, at Kitzbuhel and, very recently, at Baden.

But although nuclear warfare represents the most acute danger facing the world at present, it is by no means the only danger. Almost any discovery in science can be used for destructive purposes, and in this respect the biological and medical sciences are no exception. During the Kitzbuhel Conference several

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speakers drew attention to the rapid development of biological and chemical weapons and to the magnitude of disaster which might follow from their use in war. It is in the spirit of Pugwash to assemble scientists competent in these subjects to assess the danger.

Should the danger of biological warfare indeed be as great as it has been described, then this factor must surely be taken into account in all disarmament talks, and suitable provision made in any international agreements to ensure peace. But, even if these claims turn out to be exaggerated, biological warfare might still represent a threat to world security because of the possibility of smaller nations resorting to the use of such weapons, owing to their cheapness and ease of production.

It is a general feature of the progress of science and technology that it makes easier both living and dying; it brings about an improvement of means of production and a lowering of prices of commodities, but it also lowers the price of death. In the last war the cost of killing one person by military weapons amounted on the average to some thousands of pounds. After the development of the atom bomb, the cost of extermination fell to a few pounds per head; the hydrogen bomb has brought it down much further and the cost is now reckoned in pennies. And now we are told that killing by means of biological weapons may be even cheaper.

This may be true or not, but it is a fact that a great deal of research has been going on in utmost secrecy on the development of biological and chemical weapons, and that many attempts have been made to justify the use of such weapons. In a speech I made at Vienna after the Kitzbuhel Conference, I said that should a sudden outbreak of rabies occur, say in Berlin, it would be absurd to think that the Eastern and Western authorities would not instantly combine to find measures of extirpating the mad dogs. However, after reading the statements which have recently been made by some generals, I am not so sure about this.

General Creasy, the retired head of the U.S. Army's Chemical Warfare Service, has been reported to have advocated before a Congressional Committee to put chemical and biological warfare in the same category as the atom bomb. He is reported to have said, "We would use them when we damn well see fit in the interests of the United States and its allies," and he went on to justify these weapons as humane. It is curious that the advocates of the most horrible weapons of mass destruction always appear to be motivated by merciful reasons. Admiral Strauss, when Chairman of the United States Atomic Energy Commission, referred to the "clean" hydrogen bomb as the "humanitarian bomb."

It is of course a matter of great regret that science - particularly the medical and biological sciences - should be debased and developed in a spirit contrary to everything it stands for. It is even more distressing that a situation should have developed in which scientists find it possible and indeed desirable to

pursue such research. We have to accept this situation as a reality, however distasteful, but at least we must make an effort to try to diminish the dangers which may arise from it. It is the duty of scientists knowledgeable in their subjects to see to it that other scientists and the general public are kept fully informed about the possibilities of biological and chemical warfare.

You are a group of eminent scientists, specialists in the various fields associated with this type of warfare, and you should be in a position to make an assessment of the present situation and of the dangers which lie ahead. If you find that your conclusions may be of value to the general public, you may decide to summarize your findings in a public statement. Coming from such an authoritative group, it is bound to have a great impact on public opinion, and in this way may help to ease international tension. But quite apart from the possibility of a public statement, your discussions should help to clarify your own views and those of your colleagues, and thus be of value to the scientific community. The conditions under which you are assembled here are such as to ensure a free and frank exchange of opinion.

I should like at this stage to express the sincere thanks of the Continuing Committee and my own thanks, to Mr. Cyrus Eaton for his generosity in making this conference possible. Mr. and Mrs. Eaton have been our hosts on several occasions, and we have learned to appreciate the kindness and warmth of their hospitality. Not only are they delightful and gracious hosts, but extremely keen to promote international understanding, and in recent years they have devoted most of their time to this cause. We are indeed greatly indebted to them.

Once again I wish to tell you how much I regret that I could not make the journey to be with you today. I know that you are all extremely busy people and that coming here was a great sacrifice to you. But the very fact of your being here shows how much you appreciate the seriousness of the situation and how strong is your desire to contribute towards its solution. I am sending you my most sincere wishes for a stimulating, successful, and fruitful conference.

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Cyrus Eaton (United States)
August 24, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare 0.2

WELCOMING ADDRESS

The presence of this notable group of biological and chemical scientists in my native Pugwash gives me the deepest sense of gratification.

This little community opened its arms to our first Pugwash conference of scientists two years ago. The similarly warm welcome to this, the fifth scientific meeting under the Fugwash name, is attested by the marvelous courtesy of Principal Hamilton and the Fugwash District School Board in making the fine facilities of this ultra-modern High School available to the Conference.

Profound moral as well as political significance attaches to the grave issues that will come before this Conference. The fearsome subject of biological and chemical warfare, little known and closely guarded though it is, directly concerns all mankind.

The United States should take particular interest for ethical reasons. We are a nation of people who have traditionally set our standards by the precept, "Love thy neighbor as thyself." Every American child is brought up to know the story of the good Samaritan.

In keeping with these ideals, the United States has always placed special stress on improving the physical well being of not only its own citizens but the peoples of the rest of the world. We now have nearly 100 first rate medical schools, nearly 7,500 well equipped hospitals and nearly a quarter of a million highly trained physicians and surgeons. Every advance, every discovery, every improvement in medicine or surgery on the part of those many American institutions and individuals is instantly made available to their corresponding numbers in every other nation around the globe, regardless of creed or color.

This American dedication to human welfare runs through all segments of our society. The world well knows the vast contributions of the Rockefeller family to research in eradication of diseases. Equally impressive is the chain of well equipped and scientifically managed hospitals that has in recent years been established by the United Mine Workers of America.

To me, it is inconceivable that a nation nurtured in such high moral standards, and so strongly dedicated to the alleviation of human suffering, should ever for a moment consider embarking upon a lunatic campaign to ravage and destroy defenseless women and children with monstrous disease.

My earnest hope is that this Conference of eminent specialists in the fields of science related to biological and chemical warfare will not only fully and frankly give the rest of us the facts, however terrifying they may be. I should hope that you would also feel constrained to proclaim that the conscience of the scientist cannot condone the misapplication of great technical advances. Scientific progress deserves the fullest scope for its constructive potential, not the shame of misuse for the spreading of suffering and disease, perhaps even to the point of complete annihilation of the human race. The folly of the statesman and the vanity of the military leader cannot be allowed to go on perverting the marvelous advances of modern science to evil ends.

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J. Rotblat (Great Britain)
August 24, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare

0.3

THE PUGWASH MOVEMENT

Many of you are present at a Pugwash Conference for the first time, and it may be of some help to you to have a brief review of the activities of the Pugwash Continuing Committee and an outline of the plans for the future. As you will have seen from the background material provided by Mr. Eaton, meetings of scientists, philosophers and educationalists have been held at Pugwash every year starting from 1955. It is a little difficult to separate these annual Pugwash meetings from the Conferences I am going to describe, since their aims are in many ways similar. Perhaps it would be best if I follow Lord Russell's example and refer to my subject as the Fugwash Movement.

As Lord Russell has said, the Movement has become a symbol of the scientist's conscience and of the realization of his responsibility towards mankind. This responsibility is discharged in three ways: by clarifying the social implications of their work for scientists themselves; by educating the general public; and by attempting to contribute directly to the solution of international problems, thus helping governments to reach decisions. In the various conferences and other activities of the Fugwash Movement, these different aims can be clearly discerned.

In his opening address Lord Russell referred to his original statement of 1955, which gave rise to the Fugwash Movement, and to the first Conference, which was held here between July 6 and 11, 1957. This Conference was attended by 22 scientists, mainly nuclear physicists, from 9 countries. This was the first time that scientists from the East and West met to discuss not scientific or technical progress, but the political implications of this progress. The scientists were invited individually, and although an effort was made to ensure a balanced representation of different countries and a wide spectrum of political opinion, the participants did not represent anybody but themselves. Even so, since many of the issues discussed were highly controversial, there was a definite risk of a fiasco. Fortunately, the realization of the dangerous situation created by the development of weapons of mass destruction was sufficiently strong among the participants to ensure an atmosphere conducive to a frank and dispassionate discussion.

The First Fugwash Conference dealt with three main topics: the hazards arising from the use of atomic energy in peace and war; problems of control of nuclear weapons, and the social responsibility of the scientist. When the Conference started there appeared to be a considerable difference of opinion between scientists from the East and the West even on factual matters, such as the evaluation of hazards from nuclear weapons tests. Soon, however, it became obvious that these differences were more apparent than real, and that they arose from a

different approach to the same issues. Since scientists, on the whole, are used to reasoning and to appreciating a sound argument, it was not long before complete agreement was reached. This agreement was expressed in the public statement which was issued at the end of the Conference (copies of which have been circulated). I should add that the findings of the Conference concerning radiation hazards were substantially confirmed a year later in the report of the Scientific Committee of the United Nations, and are now generally accepted.

Perhaps the most important result of that first Conference was that it provided proof that scientists from the East and West can discuss political problems in a frank yet friendly manner. It became clear that such conferences represent an excellent medium for a free exchange of views, and for informal talks, and that it is possible to reach at them unanimous agreement on controversial issues.

Encouraged by this unanimity of purpose, the Conference decided to arrange for further meetings, and for this purpose they elected a Continuing Committee. This consisted of Lord Russell as chairman, Professor Rabinowitch from the U.S., Professor Skobeltzyn from the USSR, and Professor Powell and myself from Great Britain.

The Committee met in December, 1957, in London at a time when the political situation was very tense, following the breakdown of the United Nations Disarmament Conference. The Committee felt that there was an urgent need for scientists to meet again, this time not for the purpose of issuing a public statement, but for a detailed discussion of the most urgent political and technical problems, in an attempt to find a solution to these problems.

One of the aims of the meeting was to elucidate the areas of distrust and the causes of fear between the East and West, thus helping to clarify the issues for the scientists and indirectly for their governments. For this reason it was decided to bring together scientists who were influential with their governments or whose views were respected by them. For the same reasons participation was drawn mainly from three countries - USA, USSR and U.K.

This Second Fugwash Conference was again made possible by the generosity of Mr. Eaton. It took place at Lac Beauport, Quebec, from March 31 to April 4, 1958, since Fugwash was not convenient as a conference place at that time of the year. In accordance with the stated intention, this meeting was held in private, but at the end of it a communique was issued that listed the topics discussed. (The text of this statement has also been distributed.) The papers presented at this conference, as well as a summary of the discussions, were sent to Heads of State of 15 nations. Most of them replied, some at length, some briefly, but all expressing appreciation of the effort made. There can be no doubt that the discussions at this Second Fugwash Conference have influenced the thinking of several governments on these issues, and have contributed towards the easing of international tensions which became apparent in the summer of last year, as for

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example the decision to start negotiations on the cessation of nuclear weapons tests and to call a United Nations Conference on surprise attacks.

Apart from calling the Lac Beauport meeting, the Committee also decided to convene another and much larger Conference. The purpose of this was to serve the other aim of the Pugwash Movement, to contribute to the formation of an enlightened public opinion on the urgent issues of the day. It was for this reason that the Third Pugwash Conference was organized with the expressed intention of issuing a public statement. Taking advantage of the presence in Europe of many scientists attending various international scientific conferences held last summer, it was decided to hold this Conference in one of the European countries.

The choice of venue was decided by an invitation received from the Koerner Foundation of the Austrian government to hold the meeting at Kitzbuhel in the Tyrol; the Foundation also offered hospitality for all participants. Despite the fact that many scientists were present in Europe, the traveling expenses of such a large conference were quite heavy; but thanks to contributions from several sources, the largest being from Mr. Eaton, it was possible to convene the meeting on the scale envisaged.

The Conference was attended by 70 scientists from 20 countries. During five days, from the 14th to the 19th of September, 1958, the discussions took place in Kitzbuhel, where the meetings were held in private. Following that, all participants traveled to Vienna where two public meetings were held on the 20th of September. The first of these, a formal meeting, was attended by the President of the Austrian Republic, many diplomats and other distinguished people. It was addressed, among others, by Lord Russell and Mr. Eaton. The second meeting was a mass rally, attended by some 10,000 people, the largest of its kind in Austria; speeches were given by 10 of the participants of the Kitzbuhel Conference.

Despite the much larger attendance, the Kitzbuhel meeting was again characterized by a friendly atmosphere and frank exchange of views. Many papers were presented and there were lively discussions, but its main feature was the unanimous adoption of a statement which was released officially during the formal meeting in Vienna; hence its name, the Vienna Declaration. (Copies of this Declaration have also been distributed.)

The Vienna Declaration is a remarkable document not because it contains any new and startling pronouncements, but because it was unanimously accepted by a large gathering of scientists representing an extremely wide range of political opinion, by scientists who occupy responsible posts in their countries, and who carefully scrutinized and discussed every sentence and paragraph. I will not attempt to give you a summary of this Declaration because, despite its length, it expresses most precisely the aims and motivations of the Pugwash Movement. This is a document that has to be read in full.

Although, for some unknown reasons, the Vienna Declaration did not receive immediate publicity in the newspapers of most Western countries, it has since been published in many scientific and technical periodicals. The Committee felt, however, that this document should be given the widest possible publicity among the scientific community. At the same time it was decided to try to find out from as many scientists as possible what they thought about the Pugwash Movement and about the type of activities to be pursued. It was therefore decided to circulate to scientists the Vienna Declaration, together with a questionnaire and covering letter signed by Lord Russell.

Such mass circulation is a huge task, involving a large staff and great expense, which obviously could not have been undertaken by the Committee without outside help. Fortunately Mr. Cyrus Eaton came to our assistance and very generously offered to carry out the mailing at his expense. In addition to printing a large number of copies of the Vienna Declaration with the covering letter and questionnaire, he engaged a special staff for the addressing and mailing of the material. We aimed at sending out about 50,000 to scientists all over the world. Most of the letters were sent out from the Cleveland office, but those circulated in the Soviet Union were sent out directly from the Soviet Academy of Sciences in Moscow.

I am not yet in a position to give a final assessment of the response, since the replies are still coming in and lists of addresses from several countries have not yet been prepared. I can give you, however, a preliminary report.

In the USSR nearly 6,000 questionnaires were distributed and about 3,500 have replied; more replies are expected. The analysis of the returns shows that all scientists without exception approve of the Vienna Declaration and "recognize the important part of scientists in bringing about a relaxation of international tensions and establishment of international cooperation."

The results are not quite so clear cut in the Western countries. From the United States and the United Kingdom, only some 17 to 20 per cent of the addressees replied. The returns from France, Germany, Austria and the Netherlands are slightly lower, but they are still coming in.

The questionnaire contained four general questions and one specific question concerning the type of future activities. The general questions were:

1. Whether scientists have the responsibility to be concerned with the social and political implications of the progress of science.

2. Whether scientists should make a useful contribution towards easing international tension and establishing cooperation among nations.

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3. Whether the Vienna Declaration is approved.

4. Whether the Declaration was a proper basis for future activities of the Pugwash Committee.

The replies to all these questions were overwhelmingly positive, although not 100 per cent. The number of negative replies varied from 2.5 to 5 per cent, and there were a few per cent of neutral replies. With regard to the type of suggested activities, an interesting difference is noted between the replies from the USSR and the Western countries. The type of activities mentioned in the questionnaire were:

(a) Large open meetings directed at influencing world opinion.
(b) Smaller private conferences for exchange of views between scientists.
(c) Study groups for specific problems.

In the USSR, item (a) was considered to be the most urgent activity, and (b) and (c) less urgent. By contrast, in the USA, Great Britain and the other European countries, the majority of scientists felt that activities of type (b) and (c) should be given priority, and there was a relatively large opposition to meetings of type (a).

An important consideration arising from the analysis of the returns is the comparison of the percentages of returns from the Western countries and the Soviet Union. In the latter 55 per cent have already replied, while in the Western countries only 15-20 per cent have replied. The question was whether the remaining 80-85 per cent of scientists who did not reply were against the Pugwash Movement or whether it merely meant that Soviet scientists are much more conscientious in completing questionnaires than Western ones.

An approximate answer to this question was obtained by a second poll which was carried out in Great Britain and which consisted in sending out letters to a random sample of the 80 per cent of the scientists who did not reply, asking them to state their reasons for failing to do so. This second poll met with an exceptionally good response, nearly 90 per cent of the people approached replying, probably because this time a stamped and addressed envelope was enclosed. An analysis of these replies is quite interesting:

7.5%	said they did not reply because they do not agree with the Pugwash ideas;
17.5%	because they do not wish to be involved in anything political;
1.0%	don't like the name Pugwash;
2.0%	don't like the views of the members of the Pugwash Committee;
2.0%	thought that the Pugwash activities were futile and a waste of time;
15.0%	do not fill in questionnaires on principle;

12.5%	found no time to spare to sit down and answer the questionnaire properly;
12.5%	gave the same reason, but added that they hoped to fill it in at a later date;
18.0%	have mislaid the questionnaire and asked for another copy to be sent to them;
7.0%	were aroused from their inertia by the second letter and have sent in the completed questionnaire;
5.0%	have either died or could not be found.

If we now summarize these results in conjunction with the answers given by the 20 per cent of scientists from the U.K. who have replied, we obtain the following total analysis of the replies:

Against Pugwash	25%
For Pugwash	63%
Neutral	12%

This sort of sampling may not be precise in terms of proper polls of public opinion, but it does give a general idea about the attitudes of scientists towards Pugwash, and it certainly shows that both in Western and in Eastern countries the majority of scientists are in favor of our activities.

Apart from issuing the Vienna Declaration, the Kitzbuhel Conference has also decided to enlarge the Continuing Committee to nine people, three each from the United Kingdom, United States, and the USSR. The new members were Professors Weisskopf and Glass from the United States, and Professors Topchiev and Fedorov from the USSR. Sir Edward Bullard was the third member for the United Kingdom, but he had to resign recently owing to the pressure of other work.

When the enlarged Committee met in December of last year, it decided to convene another meeting of the Lac Beauport type, i.e., a private conference without the intention of issuing a public statement. This decision was prompted by the deadlock reached at the Geneva negotiations on the suspension of nuclear tests, and by the failure of the conference on surprise attacks; another factor contributing to the urgency was the Berlin crisis. This meeting too was held in Austria, this time at Baden near Vienna, from June 25 to July 4, 1959. It was attended by 25 scientists, and like the Lac Beauport meeting the largest groups came from the United States and the USSR.

The topics discussed included security problems and surprise attack, prevention of spread of nuclear weapons, measures for European security, control of missiles and satellites, and psychological aspects of the world situation. No statement was issued, but there is good evidence that the meeting did help to clarify the cause of difference of views between the Soviet Union and the United

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States, particularly concerning the ban on tests. We hope that the participants, after returning to their countries, will have used the new information to spread the understanding of the other nations' points of view.

I should like now to tell you briefly about our plans for future activities. One of the decisions made at the Baden Conference was to organize study groups for specific topics. One topic for a study group might be the problem of surprise attack. The official Conference on this topic held last year at Geneva broke down before it got started, since no agreement could be reached even on terms of reference. We hope scientists will not be sidetracked by procedural difficulties, and that the findings of the study group may help to break the deadlock on the official level.

Another suggested topic for study was the setting up of an international commission on arms control. The study groups would obviously have to be of international character, and to bring them about we would have to find means to enable suitable people in the different countries to take leaves of absence for several months, for the study of the problem. Following the study groups, another Lac Beauport type conference may be held next year, possibly in the Soviet Union.

Another contemplated acitivity is a conference on the industrialization of underdeveloped countries, which is planned to be held in India in December, 1960. On the initiative of the Continuing Committee a conference on international scientific collaboration is being organized jointly by the Academies of Science of the United States, the USSR, the Royal Society, etc.

We are also contemplating calling a much larger conference in 1961 to deal specifically with the role and duties of scientists in the atomic age and with the future organization of the Pugwash Movement. This will also be the occasion for the Continuing Committee to lay down its mandate. This conference may decide to set up formal international organization of scientists with a central office, as has been suggested by some people, but until then we feel that the work should be carried out by national sponsoring bodies and coordinated by the Continuing Committee. Such sponsoring bodies, consisting of some 20 to 30 eminent scientists, have already been set up in several countries, and many more are in the process of formation. The functions of these bodies will also include helping the Continuing Committee in planning future activities, and advising on the individuals to be invited to conferences.

We intend of course to keep all these sponsoring bodies as well as participants of all Pugwash Conferences, informed about all our activities. For this purpose a news letter will be prepared from time to time and circulated to all those people including all those present here.

This brings me finally to the Fifth Pugwash Conference. At the Vienna Conference several speakers called attention to the fact that apart from nuclear

weapons, a great danger is facing mankind from the development of chemical and biological weapons. This is clearly a subject within the terms of reference of the Pugwash Movement, and the Committee decided therefore to convene a conference devoted to this topic. Since this decision was made, chemical and biological weapons featured very frequently in the news, and a definite attempt appears to be being made to justify the use of these weapons by stressing their humane nature as compared with nuclear weapons. Lord Russell has already referred to the statement by General Creasey. In the same vein is the article by General Rothschild in which he claims that by being afraid to mention biological weapons, we are missing a chance to develop a merciful alternative to the atomic bomb.

This conference too may reach the conclusion that it is bad to keep the development of chemical and biological weapons secret, but I trust that this will be for different reasons than those given by Rothschild and Creasey. It will be a sad day when the main reason for scientists to make progress in their work is to produce cheaper means of death, even if less painful. This world is big enough and rich enough to enable everybody to live, and to live well. Science can make this possible, and this is the type of application of our work which we are most happy to see.

We realize, however, that to live in this world we must have security, and this is certainly lacking at the present time. We can hardly call secure the precarious balance which relies on deterrence, massive retaliation, strategic counter force, etc., whether based on nuclear weapons or on chemical and biological weapons, whether using the threat of extermination by dirty hydrogen bombs or by the merciful and humane biological poisons.

The only way to achieve security is by eliminating fear and distrust and by learning to live with each other and to trust each other. It is in the Pugwash tradition to contribute towards that aim by bringing together people from all over the world to discuss the most burning questions in an atmosphere of good will and friendship. This was the object we set ourselves when we first met two years ago, and I hope that this Fifth Pugwash Conference will continue in the same tradition and contribute towards establishing a safer and happier world.

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Robert Stanfield (Nova Scotia)
August 24, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare 0.5

TELEGRAM

Halifax, Nova Scotia
August 23, 1959

CYRUS EATON
THINKERS' LODGE
PUGWASH, NOVA SCOTIA

PLEASE CONVEY TO YOUR GUESTS THE BEST WISHES AND A MOST CORDIAL WELCOME TO THE PROVINCE OF NOVA SCOTIA BY THE GOVERNMENT. WE ARE HONORED TO HAVE THESE DISTINGUISHED SCIENTISTS IN NOVA SCOTIA AND TRUST THAT THEIR MEETING TOGETHER WILL RESULT IN A SUBSTANTIAL CONTRIBUTION TOWARDS A BETTER UNDERSTANDING.

ROBERT STANFIELD
PRIME MINISTER OF NOVA SCOTIA

Theodor Rosebury (United States)
August 24, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare I.1

BIOLOGICAL WARFARE: SOME HISTORICAL CONSIDERATIONS

The task assigned to me, of opening our discussion on the lugubrious subject of biological warfare, is an honor and a responsibility. The previous record of Pugwash Conferences has given the world hope that agreement between East and West to avert the catastrophe of war is within the reach of man's efforts. These conferences have in fact found it comparatively easy to reach agreement on questions of nuclear warfare, simply because the facts are widely appreciated and their import is inescapable. The facts of biological warfare are not so well known, and even when known they are less compelling. If we are to assess the significance of this form of warfare we ought to begin by examining the record of its past history, including what has been done before by others in attempts to control it. I propose to review these and some related matters (1).

Development and Alleged Use of BW in War Since 1915 (2)

World War I

The history of the use or alleged use of biological weapons in war is characterized by a remarkable circumstance, namely, that although allegations are many, not a single one can be called fully authenticated. In other words, no government, and no responsible government official who was free from duress at the time, has ever admitted waging offensive biological warfare. No other evidence could be fully acceptable to all concerned.

The significant history of biological warfare ("BW") begins with allegations made against the Germans in the first World War. For example, Mr. George W. Merck (1946), in his report to the U. S. Secretary of War that was used in the official press release on American activities in this field during World War II, referred to "incontrovertible evidence . . . that in 1915 German agents innoculated horses and cattle leaving United States ports for shipment to the Allies with disease producing bacteria." Earlier writers (LeRenard, 1936; Popescu, 1936; Duffour, 1937; LeBourdelles, 1939) had mentioned German attempts to innoculate horses with glanders, and cattle with anthrax, at Bucharest, Roumania, in 1916, and on the French Front in 1917. This Roumanian episode was detailed and documented in a book published in 1919 (de Flers), and was alluded to a few years later by Bordet in a report to the League of Nations (a) Commission at Geneva. There were other allegations in the late 1930's (Duffour; LeBourdelles) of attempts by the Germans to spread

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cholera in Italy during World War I. That none of these efforts could have achieved a significant military result is suggested by a remark that appears in the League of Nations record in 1924 (a): "In contradistinction to the chemical arm, the 'bacteriological arm' has not been employed in war" (3).

World War II

There is evidence that during the Second World War both Germany and Japan developed biological weapons. The charges against Germany appear in the record of the International Military Tribunal (1947-48) at Nuremberg, where they seem not to have gone beyond "preparation for bacteriological warfare" (my emphasis). In fact, this part of the indictment seems comparatively trivial in the appalling context of other "crimes against peace," "war crimes," and "crimes against humanity" of which the Nazi leaders were convicted. Closely related in this record, however, are the charges of the use of involuntary human subjects in pseudo-scientific "medical experiments," some of which involved innoculation. According to a statement adopted by the General Assembly of the World Medical Association in 1948 (4):

> "The Soviet Extraordinary Commission established that the Germans took deliberate steps to spread typhus among the Soviet population and the Red Army . . ."

but a year later an official Soviet document (5) made only the charge of "preparations for employing the bacteriological weapon . . ." Merck, in the document cited before (1946), mentioned that American Intelligence had obtained

> "A thorough knowledge of German activities in this field . . . (and that) all evidence to date indicates that the Axis powers were behind the United States, the United Kingdom and Canada in their work on biological warfare."

More explicit information is available regarding Japanese BW activities during World War II. The opening "Note to the Editors" in the official U. S. press release (Merck, 1946), to quote from it again, begins as follows:

> "Intelligence reports of investigation conducted by Military Intelligence agencies in Japan after the occupation and received here after Mr. Merck had prepared his report to the Secretary of War show that Japan had made definite progress in biological warfare. From these investigations it is known that the Japanese Army fostered offensive developments in this field from 1936 until as late as 1945.
>
> "Intensive efforts were expended by Japanese military men toward forging biological agents into practical weapons of offensive warfare.

> Modifications of various weapons developed through research in their laboratories were field tested at Army proving grounds where field experiments were also conducted in the use of bacteria for purposes of sabotage. These efforts were pursued with energy and ingenuity. While definite progress was made, the Japanese had not at the time the war ended reached a position whereby these offensive projects could have been placed in operational use.
>
> "There is no evidence that the enemy ever resorted to this means of warfare . . ."

The American military commentator Hanson W. Baldwin wrote as follows in the same year (6):

> "The Japanese are known to have experimented considerably with biological warfare, but the Germans had done little. The Japanese had developed, before the war ended, a crude anthrax bomb, and they had a 'B.W.' (biological warfare) factory near Harbin, Manchuria, which was producing toxins or bacteriological poisons."

In December, 1949, twelve Japanese military prisoners, including the former Commander-in-Chief of the Kwantung Army, were tried at Khabarovsk, U.S.S.R., on charges of having prepared and employed bacteriological weapons. The proceedings of the trial were published in 1950 (5). The trial record contains detailed charges especially against the so-called "Ishii Detachment" of the Kwantung Army. General Shiro Ishii, who was not captured by the Soviet forces, was named as the "ideologist of bacteriological warfare" whose laboratory work initiated the Japanese BW program, and who subsequently, with other bacteriologists, acted as its technical leader. The Soviet record, including detailed confessions, supports allegations made earlier in China that the Japanese had used the plague bacillus in attacks on that country. These latter charges had been credited by Thomas Parran, then Surgeon General of the U.S. Public Health Service, and by R. Pollitzer, League of Nations epidemiologist (7).

From the testimony at the Khabarovsk trial it appeared that extensive Japanese development of BW began in 1931 soon after the occupation of Manchuria, and that two large installations for the work were built in Manchuria in 1936, one of them 20 kilometers from Harbin. Three principal methods of utilizing bacteria for war purposes were said to have comprised spraying them from aircraft, dropping special bacterial bombs from aircraft, and contaminating water sources, pastures and inhabited areas of land by methods of sabotage. The microbic agent most prominently mentioned was that of plague. "Hundreds of millions of fleas" were said to have been bred in special chambers. The agents of cholera, typhoid and paratyphoid fevers and

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anthrax were also mentioned. Chinese and Soviet prisoners were recorded as having been used as subjects in BW experiments, with fatal results; and, beginning in 1939 or 1940, the Ishii Detachment was said to have made actual bacteriological attacks, first against Chinese or Mongolian troops and later against the civilian population of China. Although no details were given as to the consequences, several outbreaks of plague, at least one of which was termed "severe," were said to have resulted; and other "severe outbreaks of infectious disease" including typhoid fever, were mentioned as having occurred in consequence of BW attacks.

The report of the International Scientific Commission (8), which I shall mention again later, speaks of official Chinese records that gave the total number of victims of plague resulting from Japanese BW attacks between 1940 and 1944 as approximately 700. A story in the New York Times in 1955 (9) cited a Japanese writer, Hiroshi Akiyama, as giving "a purported eyewitness account of Japanese germ warfare tests in World War II in which 1500 to 2000 human guinea pigs supposedly died." The tests were said to have been made at a center near Harbin, Manchuria, which was masked as a Red Cross Unit, and was hurriedly destroyed in August, 1945, when the Soviet Union entered the war in that area. Akiyama was quoted as having written, "'I hereby dare to make public this report after ten years' silence because I wish to help prevent the third world war.'"

British, Canadian and American activity in biological warfare during the Second World War consisted of extensive research and development that have been described in official and unofficial statements, the latter including my book, Peace or Pestilence (Rosebury, 1949). These operations are known to be continuing (9a) and the wartime Camp Detrick, the research and development center in Maryland, has become Fort Detrick, a so-called "permanent" installation. Among the known activities have been BW field tests, the details of which are secret. It was noted in the press, for example, in 1954 (10), that Great Britain conducted such tests in the Bahama Islands area; and in 1957 a biologist at Utah State Agricultural College (Pfeiffer, 1957) published a paper protesting against American field tests of BW at Dugway, Utah. During the War and through 1946, when my official connection with BW ended, I knew of no suggestion that biological weapons had ever been used by the Western Allies for any military purpose or deliberately against human subjects. Just to set the record straight, moreover, and in view of certain innacurate comments about me to the contrary, let me note that I have never held a policy-making position in this field.

The Korean War

Since the end of World War II allegations of actual military use of biological weapons by the United States have been made on several occasions

from countries in the Soviet group (11). Among these charges only the ones pertaining to the Korean War require close scrutiny; and among the documents on the Korean War our present purpose may be served if we limit our attention to one that was offered as a scientific study of the circumstances. This is the Report of the International Scientific Commission (8), published in Peking in 1952, comprising, with appendices, nearly 700 pages. The charges were categorically denied by American authorities, and the depositions made by U. S. military personnel while they were prisoners of the North Korean and Chinese forces were, so far as I can recall invariably, repudiated upon the return of those persons to the United States (12).

The International Scientific Commission was invited in the name of the Chinese National Academy (Academia Sinica) and the Chinese Peace Committee to check the charges of germ warfare made earlier by the North Koreans and Chinese. The signers of the ISC Report comprised six professional men in the fields of public health or of medical or biological science, from Sweden, France, Britain, Italy, Brazil and the U.S.S.R. The best known member of the group in the English-speaking world is Joseph Needham, British biochemist and Sinologist. The Soviet member of the group, Professor Zhukov-Verezhnikov, had been chief medical expert at the Khabarovsk trial.

Only a brief abstract of this document can be given here. I would characterize it without prejudice as remarkable. I suggest that whether it be read as a work of imaginative fiction or as a study in abnormal epidemiology, and in the latter event whether its conclusions be accepted in any degree or not, the Report is nevertheless required reading on the subject of biological warfare. It contains sidelights on BW that are not to be found elsewhere so far as I know. Among them is an abridged translation (given as Appendix Q) of a paper by Ryohei Sakaki, reproducing 3 facsimile pages in Japanese, from the weekly journal, Mainichi (13). Sakaki is listed as a former Major in the "Epidemic Prevention Service" of the Japanese Kwantung Army. His paper begins with a description of a military conference in October, 1936, and continues as follows:

> "To make use of bacteria and other micro-organisms as weapons is not only definitely possible, but it is now also certain that they will become very strong and powerful weapons. Henceforward it will be a main task to find out how to convert them into effective weapons."

Sakaki then proceeds to a discussion of bacterial attack by "spraying," "showering" and "dusting," and follows this with explicit details and diagrams of containers and devices for the dissemination of biological agents, some of them self-destroying, with attached parachutes, in one instance designed to

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carry plague-infected rats. If this paper be science fiction it has considerable verisimilitude.

The ISC Report itself was presented as having been based on studies made in China and North Korea between June 23 and August 31, 1952, including approximately three weeks in the zones said to have been involved in BW attacks. The principal means by which the Commission arrived at its conclusions were given as examination of Korean and Chinese documentation and "personal tests, examinations, interrogations, etc., carried out by the members of the Commission." It was mentioned that Shiro Ishii, whom the Khabarovsk trial record had named as a leader of Japanese BW during World War II, had made two visits to South Korea in early 1952; and the Report noted that "whether the American Far Eastern Command was engaged in making use of methods essentially Japanese" was a question considered but not resolved by the Commission. Anomalous epidemiological phenomena were emphasized among other evidence pointing to artificially induced rather than naturally occurring disease. For example, a variety of arthropods, identified as being not natural but possibly artificial vectors of disease in man, some of them of diseases of plants, were described as occurring in high concentrations and in anomalous locations and seasons. The Report also mentioned bacterial and fungal plant pathogens as having been dropped by American planes. Details of a series of alleged BW incidents were all associated with American planes and included much supporting data. Among them was a plague outbreak with 50 cases and 35 deaths in a population of 600, occurring after the appearance of concentrations of the human flea Pulex irritans on a bare hillside in February. In another incident there had been observed large numbers of plague-infected voles, rodents otherwise unknown in the area. Again, Bacillus anthracis had been isolated from insects and feathers found with fragments of a metal and calcareous container reported as seen to drop from an American plane; and in another instance, fatal human cases of respiratory anthrax and hemorrhagic anthrax meningitis were described in detail and associated with the dropping of various objects by American planes.

> "In one case (in the matter of this incident) several people saw an object like a large red thermos flask thrown down, which seemed to burst with an explosive puff and a disagreeable smell like burning skin or horn when about 30 feet from the ground."

Elsewhere two fatal cases of cholera were attributed to ingestion of contaminated clams in a rural area as part of an episode described in detail as an unsuccessful attempt to contaminate a series of reservoirs from the air. Finally, the Report described an outbreak of an acute encephalitis with a 73 per cent case mortality, thought to be of viral origin and to have followed an attack using the airborne route of dissemination; but attempts to isolate a virus were unsuccessful, and the evidence of BW was presented as admittedly incomplete. The Report included extensive details of BW containers or bombs, corresponding in many respects with those described by Sakaki and also with "samples of Ishii earthenware bombs collected from the ruins of the factory near Harbin" which were shown in a photograph following Appendix Q.

As I mentioned earlier, this Report stated that some 700 victims of plague had been attributed to Japanese BW attacks on China during the Second World War. Morbidity and mortality data on the alleged attacks during the Korean War were deliberately withheld. The Report suggested that contrary to widespread opinion the development of hygiene throughout China had been so rapid and successful by 1952 as to minimize the effects of BW. Nevertheless there is no implication that the consequences of the alleged attacks were minor. The body of the Report, in fact, ends with this sentence: "All people should be aware of the potentialities of this kind of warfare, with its incalculable dangers."

We need not attempt to judge the validity of these allegations, but it is worth our while to speculate on them. They might conceivably have been inventions; it is possible, although highly unlikely, that they were all natural outbreaks of disease mistaken for BW; or some may have been one and some the other; or there may have been mixtures of the two. If we assume without implying a judgment that some of the allegations may be taken at their face value, and particularly if we argue that, with a basis in fact, they were exaggerated for purposes of propaganda, it would seem to follow that biological warfare, as it has been applied thus far in war, is hardly to be compared with nuclear armaments as a weapon of mass destruction. But--continuing the same line of thought--it may be suggested that the attacks with biological weapons that have been made thus far have all been only tentative or exploratory or otherwise below available potential, not to speak of future possibilities. In line with this thought is the suggestion in the ISC Report that BW in the Korean War may have been "Japanese" at least in style. Mr. Merck's remark will be recalled that "the Axis Powers were behind" the Western Allies in BW development at the end of World War II. In sum we are left with no reliable information on the capacity of BW from the history of its alleged use in war. I suggest that in attempting to make the assessment expected of us we keep in mind the phrase used by the ISC, "incalculable dangers," applying to the adjective both of its alternative meanings, "undeterminable" and "illimitable."

ATTEMPTS TO PROHIBIT OR CONDEMN BW

In the League of Nations, up to 1925

Attempts to control biological warfare by international agreement began in the years between the two World Wars. The Washington Disarmament Conference of 1922 had reaffirmed the prohibition of the Hague Convention of 1907 against poison or poisoned arms and had extended it to "asphyxiating gases and all analogous liquids, materials or devices," language broad enough to include BW. The first explicit mention I have seen of bacterial warfare in connection with an attempt to limit its use was in 1923, when the Temporary Mixed Commission for the Reduction of Armaments of the League of Nations (b) requested that a statement be obtained "from the most qualified experts" on

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both chemical and bacterial warfare. A committee consisting of Professors Pfeiffer, Bordet, Madsen and Cannon reported on July 30, 1924 (League of Nations (a)) that:

> " . . . the effects of the bacteriological arm can neither be measured nor localized; they would reach the civilian population, would cross frontiers, and might reappear or continue even after the cessation of hostilities. It may be said that this arm would be aimed indirectly against all mankind.
>
> "Professors Pfeiffer, Bordet and Madsen, however, are of the opinion that such warfare would have little effect on the actual issue of a contest in view of the protective methods which are available for circumscribing its effects.
>
> "The pollution of drinking water by cultures of typhus (sic) or cholera germs would be combated by filtering, as already practiced in large centers, or by treating the waters of rivers with chlorine. The enemy would have to contaminate, by means of aircraft, the filtered water of the reservoirs directly: this would be a difficult operation and its effects could be frustrated by preventive vaccination.
>
> "The propagation of plague by pest-infected (sic) rats would be as dangerous for the nation employing this method as for its adversary... the danger of an epidemic of typhus propagated by lice has greatly diminished . . . the only method presenting a certain danger would be that of dropping from aeroplanes glass globes filled with germs.
>
> "Finally, the majority of the experts are of the opinion that bacteriology cannot at present produce infective substances capable of destroying a country's live stock or crops. Professor Cannon, however, . . . admits the possibility of aeroplanes disseminating over wide areas parasites capable of ravaging the crops. The scientists . . . are of the opinion that our present knowledge of hygiene and microbiology would limit the extension of any epidemics that might be spread either among combatants or in any civil population, and that such epidemics could not have any decisive influence on the issue of hostilities . . ."

The Committee noted, however, that the statement of the experts

> " . . . does not . . . constitute the final word on the subject; for although the conclusion drawn may be comparatively reassuring for the present, they nevertheless direct attention to the possibilities which the development of bacteriological science may offer in the future . . ." (loc. cit.).

The Geneva Protocol

Following these discussions the Geneva Protocol was signed on June 17, 1925 by 47 countries, among them the British Empire, China, France, Germany, Italy, Japan, the United States and the Soviet Union, and came into force February 8, 1928 (League of Nations (c).) The Geneva Protocol prohibits "the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices," and extends the prohibition to "the use of bacteriological methods of warfare." Six of the signatory countries failed to ratify the Protocol, including Japan and the United States. Among the ratifying countries sixteen specified that the Protocol was binding only as regards States that had signed and ratified it or acceded to it (among them Britain and its Dominions, France and the U.S.S.R.); and the same nations with three additional ones reserved the right of reciprocity--that is, the right to use the weapon against another nation that used it first.

The League of Nations, 1928-1933

After the 1925 protocol had been signed, a Preparatory Commission for the Disarmament Conference continued discussions on both chemical and biological warfare as well as on other weapons. During this period, while the clouds of the Second World War were gathering, chemical warfare continued to claim the greater attention; BW, in fact, seemed hardly to be taken seriously. The idea of reciprocity, which had been attached to the Geneva Protocol by individual ratifying nations, was introduced for chemical warfare in 1929 (League of Nations (d)) as part of the wording of the draft prohibition, and persisted to the final draft; but BW continued to be prohibited "unreservedly." A Special Committee was appointed by the General Commission on May 19, 1932, to consider chemical and bacterial warfare in the light of a resolution distinguishing qualitative from quantitative disarmament. The Committee reported back on May 31, 1932, offering the unanimous opinion that both chemical and bacterial warfare should be included within a system of qualitative disarmament because they were the most threatening to civilians. It was further stated by this Committee:

> "That the use of pathogenic microbes for the purpose of injuring an adversary is condemned by the conscience of humanity...
>
> "...that all methods for the projection, discharge or dissemination in any manner, in places inhabited or not, of pathogenic microbes in whatever phase they may be (virulent or capable of becoming so), or of filter-passing viruses, or of infected substances, whether for the purpose of bringing them into immediate contact with human beings, animals or plants, or for the purpose of affecting any of the latter in any indirect manner--for example, by polluting the atmosphere, water, foodstuffs, or any other objects--should be included in qualitative disarmament." (League of Nations (e), p. 104)

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A final draft Disarmament Convention was prepared in 1933 incorporating provisions regarding chemical and bacterial warfare in accordance with the preceding discussions. This work was interrupted by the withdrawal of Germany from the Conference and from the League of Nations on October 14, 1933. The principal features of the provisions relating to chemical and bacterial warfare in the draft Convention were summarized in the Preliminary Report of the Work of the Conference published in 1936 (League of Nations (e), p. 111) as follows:

> ". . . The use of chemical, incendiary, or bacterial weapons against any State or in any war whatever its character, is prohibited. All preparations for such warfare are prohibited in time of peace as in time of war. The right of reprisals, however, is recognized, as is the freedom of the contracting parties in respect of material or installations intended to ensure individual or collective protection . . ."

These provisions may be characterized, if only by hindsight, as contradictory and unworkable, since to reserve the right of reprisals, in particular, would have vitiated the prohibition against preparation for such warfare, which would in turn have seriously weakened the primary prohibition against the use of chemical and bacterial weapons. In this respect, therefore, adoption of the draft Convention of 1933 would have represented a step backward from the Geneva Protocol of 1925. This opinion must be considered, of course, in the context of the political history of the period.

BW in the United Nations

After World War II the question of biological warfare again emerged; and in view of its development during the war it now overshadowed chemical warfare; but nuclear weapons have of course become the primary problem of disarmament in the post-war period. Beginning with the Truman-Attlee-King Declaration of November 15, 1945 and continuing through the establishment of the U.N. Atomic Energy Commission on January 24, 1946, the same phrase recurs in the terms of reference, namely, "the elimination from national armaments of atomic weapons and of all other major weapons adaptable to mass destruction." Weapons of mass destruction were defined by the U.N. Commission for Convention Armaments (United Nations (a)) so as explicitly to include biological weapons. Biological weapons, however, were only mentioned occasionally (14) during the subsequent discussions of the U.N.A.E.C.; and on July 5, 1948, Secretary-General Trygvie Lie commented regarding both chemical and biological warfare that:

> ". . . not a single proposal has been made by any of the Member nations for any system of preventing or controlling their manufacture, nor has there been any discussion or study of the problem in the United Nations . . ." (U.N.(b))

At the Fourth Regular Session of the U.N. General Assembly in 1949, General Romulo, presiding, proposed calling an international scientific conference. This proposal was taken up by the Secretary-General, who also proposed that a discussion of the international control of weapons of mass destruction, including biological weapons, be held at a special meeting of the Security Council. Early in 1950 I was asked and agreed to serve temporarily as a consultant in the U.N. Secretariat to help compile an annotated bibliography of BW to be used in connection with such a meeting. This work was interrupted soon after the outbreak of the Korean War in June, 1950, and to my knowledge has never been completed.

In May, 1952, the U.N. Human Rights Commission rejected a Soviet proposal which, according to its sponsors, would have prevented governments from "criminal misuse" of science for the development of atomic bombs or germ warfare (15); and on December 1, 1955, Rickard Sandler, Swedish representative, suggested to the General Assembly Political and Security Committee that since control of nuclear weapons had failed, the problem of the prohibition of chemical and bacteriological warfare should be taken up (16).

Other Declarations

Condemnation of BW, nearly always explicit, sometimes qualified, has come since World War II from several additional sources, including international scientific and medical congresses and two groups of the International Red Cross. Details are given in an appendix to this paper.

FURTHER LEGAL AND ETHICAL CONSIDERATIONS OF BW

There is one curious respect in which biological warfare seems pre-eminent with little dispute: it is widely thought of as the most odious or abhorrent form of warfare. I mentioned this opinion in my book, written in 1948. It seems worth examining again from a later perspective, and I propose to do so briefly, first in general terms and then more specifically.

This judgment of biological warfare may be looked upon as a footnote to the history of attempts to formulate rules for the conduct of war. I have in mind not the rules of war devised by, or for the special benefit of, military commanders or heads of state; but rather those conceived in the name of mankind generally. Conspicuous, perhaps pre-eminent, among writers in the second group, is Jean Jacques Rousseau. A passage from The Social Contract, published in 1762 (17), is pertinent:

> "War . . . is a relation, not between man and man, but between State and State, and individuals are enemies only accidentally, not as men, nor even as citizens, but as soldiers; not as members of their country,

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> but as its defenders. Finally, each State can have for enemies only other States, and not men . . .
>
> ". . . The object of the war being the destruction of the hostile State, the other side has a right to kill its defenders, while they are bearing arms; but as soon as they lay them down and surrender, they cease to be enemies or instruments of the enemy, and become once more merely men, whose life no one has any right to take . . . war gives no right which is not necessary to the gaining of its object. . ."

These words are part of the great tradition of political democracy out of which both the American and the French revolutions arose. They have not achieved universal acceptance in either country; but their continued viability at least up to 1907 is witnessed by the presence of almost identical ideas in the preamble and text of the Hague Convention of that year. Indeed, one can also find clear suggestions of them in documents, embodying fundamental aspects of international law, as recent as the Charters of the Nuremberg Tribunal and of the United Nations itself. The same tradition, it seems to me, is also traceable in the specific conventions on chemical and biological warfare, or the attempts to formulate them, of the 1920's and 1930's.

Possibly even closer to the roots of the same tradition is the basic opinion or sentiment that finds in biological warfare a focus of violent distaste. The implied judgment is not objective or quantitative; it seems to me rather that BW somehow suggests in unmitigated form all those characteristics of war that people find hateful: that BW is a sort of type species of abhorrence.

That biological warfare is in fact regarded with distinctively virulent aversion is a matter not easily documented; but a sampling may suggest it. I think the feeling is common in the comparatively mute general public, whom I cannot cite; but it has been shared and expressed by articulate persons whose responsibility and general rationality seem to meet ordinary standards. As early as 1932, the Special Committee of the Preparatory Commission in the League of Nations called bacterial warfare "so particularly odious that it revolted the conscience of humanity more than any other form of warfare" (League of Nations (f). When Mr. James F. Byrnes was U.S. Secretary of State, on November 16, 1945, he declared that "bacteriological warfare (is) an even more frightful method of human destruction" than the atomic bomb (18). The Fourth International Congress of Microbiology, in 1947, called BW "barbaric" and "absolutely unworthy of any civilized community" (Rosebury, 1949); and Niels Bohr, in 1950, expressed an opinion that I think may be fairly typical when he spoke of biological weapons as "terrifying." A similar view seems to be implicit in some of the statements of several American military leaders, among them James Forrestal, when he was Secretary of Defense (19) and

recently, retired Brig. Gen. J. H. Rothschild (20, 9a), in that their attempts to reassure the public that BW is not so horrible as they thought presupposes the thought.

An attitude toward BW in Communist countries, if I am able to assess it correctly, seems a little different but not opposed. It is expressed in the record of the Khabarovsk trial by the repetition of such words as "criminal," "inhuman" and "brutal": but there is no implied comparison with other forms of warfare. In another statement (21), in which the United States is accused of "war crimes in Korea," the terms used are "a most grave and horrible crime," "inhuman," and "a new degree of savagery"--the last phrase presumably implying that BW is more "savage" than the atomic bombings of Japan in 1945. In the ISC Report on Korea (8), on the other hand, such phraseology is absent. Yet implicit in that document, and possibly also in the violence of the reaction to these charges in the United States, is this idea of extreme abhorrence, which does not seem to attach in a comparable way to any other weapon, including napalm and nuclear weapons. The use in war of both these latter has of course been freely admitted.

This feeling of horror or extreme aversion with which biological warfare is commonly regarded may have a consequence that has not been explicitly considered to my knowledge. The assumption is often made that part of the military effectiveness of such weapons would depend on terror and a demoralization resulting from terror, not directly (in contrast to the expected effects of such chemical warfare agents as LSD), but rather indirectly, associated with the occurrence of strange phenomena of disease, not amenable to the customary means of detection or control. The reasoning behind this presupposition may depend in part on analogy with great natural epidemics of history, particularly those of plague as they were described by Boccaccio and Defoe. Behind the argument may lurk an assumption that the attacked population would be ignorant and undisciplined. I suggest that the whole idea may be an error. It seems to me possible that if the use of biological weapons were to inspire aversion or hatred rather than terror, its effect might be to strengthen morale rather than to destroy it. Assuming that an attack, of which BW was strongly suspected to be a part, did not bring total devastation in its train, then the effect of a weapon considered particularly loathsome might be to arouse the attacked population so that they would gather up all their remaining strength and mobilize every latent resource to resist the attackers. I suggest as a possibility, then, that if the effects of biological warfare could ever be objectively known, such weapons might turn out, from the strictly military point of view, to be useless or less than useless. The results of the Nazi bombings of England have been thought of in this way; and according to Blackett (1948) the strategic bombings of Germany during the Second World War failed to accomplish their purpose presumably for just such reasons.

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CONCLUSION

It is most auspicious that an international group of qualified scientists has finally been brought together to consider the problem of biological warfare and what to do about it. Such an undertaking is approached by first attempting to delineate and assess the problem, and my remarks are offered as a first step in such a process. But it is safe to predict that the technical approach, although indispensable at the outset, will not be enough. Even with nuclear weapons, for which technical information is much more extensive and available, and of which the issues to the scientist are clear with hardly any argument, the methods of science and technology alone have been no more effective in solving the problem of world security than the methods of politics alone. The problem of biological weapons seems sure to be even more refractory if approached in the same way. Let me close, therefore, by urging that we go back to a first principle as it was put forward on June 23, 1946 by Albert Einstein: Science has brought forth this danger, but the real problem is in the minds and hearts of men.

APPENDIX

Other Declarations on BW

In addition to the resolution of the Fourth International Congress of Microbiology noted in the text, another was approved during the same month (July, 1947) by the International Cytological Congress, meeting in Stockholm, which stated that:

> ". . . we as biologists are especially concerned with the prevention of all warfare, and in particular with biological warfare"

and undertook to

> "set up a committee to offer technical advice and assistance to the United Nations Organization . . . and (to) invite the International Association of Microbiologists to form a joint committee with us for this purpose" (22)

It is doubtful that such a committee ever came into being: unsuccessful attempts were made by the staff of the U.N. Secretariat in 1950, while I was working there, to obtain information about it.

The General Assembly of the World Medical Association adopted a statement in September, 1948, in the course of which, after mention of the charges, including those of BW, made by the International Military Tribunal at Nuremberg and by the Soviet Extraordinary Commission (as mentioned in the

text), as well as allegations from other sources, the following paragraph appears:

> "Having considered this evidence and the statements made to the General Assembly by medical representatives of countries which had been occupied by the Germans and by doctors who had personally experienced German brutality, the World Medical Association endorses the judicial action taken to punish those members of the medical profession who shared in the crimes and it solemnly condemns the crimes and inhumanity committed by doctors in Germany and elsewhere against human beings, both during the Second World War and in the years preceding that war." (23)

In April of 1952 a Belgian journal of military medicine published three consecutive papers (Constant, et al, 1952) reporting on a meeting of military doctors held at Vichy in 1951 and on the initial results of a questionnaire that had been authorized at that meeting. The series was presented under the general title, "The limits of the medical role in biological warfare." The meeting, at which delegates were present from 14 small countries principally of Europe, was concerned about problems of professional ethics in relation to BW, and "anxious not to be the war criminals of tomorrow." The delegates voted to authorize an international inquiry as a step toward codification of medical practices in relation to war, and especially to biological warfare. The questionnaire, drawn up accordingly, elicited responses from 16 countries. The questions dealt with (1) the role of physicians in research on so-called ABC (atomic-biological-chemical) warfare; (2) the propriety of publishing such research; (3) the responsibility of medical authorities for the work of their subordinates in such research; (4) the responsibility of military medical personnel to their non-medical superiors in such research; and (5) the physician's recourse if he should refuse to follow orders in the preceding category. The replies were far from unanimous or in any way decisive. Research was held generally to be permissible with restrictions on the use of human beings as subjects (a matter more recently reviewed, apart from BW, by Beecher (1959). There was no resolution of the matter of publication. Physicians were held to be fully responsible for the acts of subordinates; but complete confusion reigned in the next area of their responsibility under orders from above; nor was there any agreement on the final question of appeal.

The Eighth General Assembly of the World Medical Association, held in Rome in the fall of 1954, heard an address by Pope Pius XII in which the Pope "re-echoed an appeal for the effective proscription of what he called 'ABC' warfare which was contained in his Easter message" and went on to speak of the role of physicians in such warfare in terms difficult to quote briefly. Their tenor is suggested by the following excerpts from a report of his address (24):

> ". . . one prefers not to see the doctor occupied with a task of this sort. It is in too great a contrast to his basic duty; to give aid and cure, not to do injury or kill . . ."

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On an earlier occasion the Pope had said:

> " . . . may the doctor put his knowledge and activity at the service of ABC warfare? 'Injustice' he can never support, even in the service of his own country, and when that type of war constitutes an injustice, the doctor may not take part in it."

The following newspaper story, relating to the same W.M.A. meeting, is quoted in full (25):

> "Rome, Sept. 30 (AP)--The World Medical Association approved today a resolution condemning bacteriological warfare.
>
> "A U.S. amendment provided that any limitation must be equally applicable to all countries. The amendment, as approved, also eliminated from the resolution a clause 'prohibiting physicians from taking any part in bacteriological research aimed at the preparation of germ weapons.'
>
> "The action was unanimous by doctors representing the association's fifty-two nations--all of them outside the Iron Curtain. The proposal was made by Dr. Augusto Fernandez Conde of Cuba. It proposed that the medical association reject any use of bacteriological arms, prohibit doctors from helping develop such forms of warfare, and call for the formation of a commission to help outlaw germ warfare."

I could find no mention of this resolution in the account of the Rome meeting in the World Medical Journal (26) or the Journal of the American Medical Association (27).

On May 28, 1954, the Board of Governors of the International Red Cross, meeting at Oslo, "adopted a resolution . . . calling for a ban on nuclear, chemical and bacterial warfare," without opposition but with four Communist nations not voting (28). Among the "Rules limiting the risks run by the civil population in times of war" adopted by the 19th International Conference of the Red Cross at New Delhi in the autumn of 1957, Article 14 "forbids, without prejudice to existing or future prohibitions of specific weapons, the use of weapons whose injurious effects--in particular those brought about by the spreading of incendiary, chemical, bacteriological, radioactive or other agents--could spread in an unforseeable manner or escape, in space or in time, the control of those using them and would thus endanger the civilian population" (Vitanyi, 1958).

NOTES

(1) The use of biological agents to exterminate pests--a humanitarian enterprise--is properly distinguished from warfare under the term "biological control." Since

the earliest efforts of Pasteur and Loir (see Dubos, 1950) to kill rabbits by infecting them with Pasteurella multocida there have been continued studies in this field down to the present time, notably the work of Steinhaus and his colleagues (1945; Thompson and Steinhaus, 1950; see also Fleschner, 1959) on the use of micro-organisms and polyhedrosis virus for the control of insect pests; and the studies of Burnet (1952) and of Fenner and his co-workers (1957; Marshall and Fenner, 1958) with myxomatosis virus against rabbits in Australia.

(2) The earliest attempt at true biological warfare seems to have been the 18th Century episode involving the spreading of smallpox among American Indians. (See Stearn and Stearn, 1945.)

(3) I have referred elsewhere (Rosebury, 1949) to the plausibly detailed allegations of the British journalist Wickham Steed (1934) regarding German experiments with airborne Serratia marcescens in the underground railways of Paris and London, said to have begun in 1931 and to have continued under order of Hitler. These charges were quickly denied by a German journalist, although less plausibly. They did not figure in later accounts of German BW activities made during the trials at Nuremberg.

(4) World Med. Assoc. Bull. 1949, 1:4.

(5) Materials on the Trial of Former Servicemen of the Japanese Army Charged with Manufacturing and Employing Bacteriological Weapons, 1950, Foreign Languages Pub. House, Moscow.

(6) N.Y. Times, Sept. 27, 1946.

(7) Editorial, Med. Record 1942, 155:269.

(8) Report of the International Scientific Commission for the Investigation of the Facts Concerning Bacterial Warfare in Korea and China, 1952, Peking.

(9) July 16.

(9a) (See p. 24a)

(10) N. Y. Times, Mar. 12, Apr. 13, 1954.

(11) Only recently a brief AP dispatch (St. Louis Post-Dispatch, July 5, 1959), repeating earlier charges, attributed the following statement to Soviet commentator Grigoriy Morosov in a Moscow radio broadcast: "In 1949, the United States Army tested biological means of warfare on the Eskimos of Canada, causing an

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epidemic among them." I have not seen these charges in detail and have no further information on them. The years immediately following World War II, when BW was given wide publicity, seemed to have been favorable for the growth of sensational reports of which two examples may be cited: (a) British press reports that the Nazis had "planned to send an 'ultimatum' to the U.S.A. and Great Britain backed up by the threat of deadly germ warfare" (U.P., Feb. 25, 1947); and (b) an American news commentator's charge that the U.S.S.R. was responsible for the cholera epidemic in Egypt in 1947 (see the story by Albert Deutsch in PM, Oct. 14, 1947). In a letter to the N.Y. Times printed Oct. 19, 1947, Kabat and I characterized the latter charges as "baseless."

(12) Three Americans, John W. Powell, his wife Sylvia, and an associate, Julian Schuman, have been under trial for sedition in U.S. District Court in San Francisco since 1956 in connection with statements, including the germ warfare charges, against the United States, made in the monthly magazine China Monthly Review, published in Shanghai in 1950-1953. The Powells and Schuman had credited these charges and have not recanted. They returned to the United States from China in 1953. Early in 1959, following an order of mistrial on the sedition charge, the U.S. attorney in San Francisco attempted to secure an indictment of the Powells and Schuman on the charge of treason, but the attempt failed for lack of evidence. The three are still under indictment on the sedition charge. See Christian Science Monitor, Boston, Feb. 14, 1959; St. Louis Post-Dispatch, June 26, 1959; National Guardian, New York, July 27, 1959.

(13) No. 1683, Jan. 27, 1952.

(14) Polish U.N.A.E.C. Delegate I. Zlotowski suggested a ban on BW in the UN in 1947. See U.P. dispatch by Robert Manning, Oct. 2, 1947; N.Y. Herald-Tribune, Oct. 3, 1947.

(15) N.Y. Times, May 15, 1952.

(16) N.Y. Times, Dec. 2, 1955.

(17) Trans. G.H.D. Cole, Everyman's Library, p.9.

(18) N.Y. Times, Nov. 17, 1945.

(19) N.Y. Times, Mar. 13, 1949.

(20) Harper's Magazine, June, 1959, p.29.

(21) Report on War Crimes in Korea. Commission of International Association of Democratic Lawyers, Peking, Mar. 31, 1952.

(22) See W.L. Lawrence, N.Y. Times, July 27, 1947.

(23) World Med. Assoc. Bull. 1949, 1:4.

(24) World Med. Journ. 1955, 2:111.

(25) N.Y. Times, Oct. 2, 1955.

(26) 1955, 2:12.

(27) 1955, 156: 1256, 1602, 1925.

(28) N.Y. Times, May 29, 1954.

(9a) After this paper had been prepared, a news story appeared that is relevant to all three of the paper's subdivisions: it deals with American BW (and CW) activity, with disarmament, and with the public attitude toward such weapons. The AP story (St. Louis Post-Dispatch, Aug. 9, 1959) stated that the House Committee on Science and Astronautics said on Aug. 8, in a special report to Congress:

> " . . . the United States is now spending $35,000,000 to $40,000,000 a year on such (chemical-biological-radiological warfare) research.
>
> "'This represents about one one-thousandth of our defense budget'...
>
> "Increasing this amount over a two- to three-year period to a spending level of around $125,000,000 a year is needed, the committee said, to put this country on a par with the Communists . . ."

In the account by Jack Raymond in the New York Times (Aug. 9, 1959), the following is given among the committee's recommendations:

> "Include chemical, biological and radiological warfare in discussions of international disarmament, with particular attention to the ease of evading detection of such methods."

The Times story begins with these words:

> "Leading military officials are trying to overcome public horror of chemical, biological and radiological warfare"

and resumes on this subject further down as follows:

> ". . . officials decided recently, as a matter of policy that public support was required to make possible further developments of some promising

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and rather astounding chemical warfare techniques.

"The officials recognized the popular aversion to 'unorthodox' warfare, the outcry after the limited use of gases in World War I, and the trumped-up Communist charges that the United States had used germs as weapons in the Korean War . . .

" . . . the space committee said that while chemical, biological and radiological warfare can be 'just as disagreeable as any of the other forms of destruction in vogue in the world,' it also offers 'some rays of hope for a more sane approach to an activity which we wish could be classified as irrational.'"

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Sir Robert Watson-Watt
August 24, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare

I.2

THE DANGERS OF OFFICIAL SECRECY

I claim no credit, I accept no blame, for this gathering. I offer no justification for my own presence, save that I seem to have dragged at least one skeleton out from the obscurity of the official cupboard into the pallid twilight of parliament. Having gone thus far, I must go further. I ask leave to review the reasons for my own intense curiosity about the possibilities of Chemical and Biological Warfare.

First let me quote verbatim from myself. In two addresses, one in Toronto and one in Montreal, under the title "Dangers of the Space Age," I used substantially identical words (in one brief paragraph among many) about this one group of dangers. The words were:

"Despite a conspiracy of silence about the steps which every major power has taken to ensure that its potentials in relation to biological warfare are not neglected, the diligent reader may even have learned that the Big Bad Bomb may be surpassed in daemonic destructivity by the Poor Power's Poison. Compared with the colossal costs of delivering the nuclear bomb on target, the admitted inconvenience of distributing biological agents of destruction is largely offset by the ease and quickness of manufacture in complete secrecy, and by the unobtrusiveness and cheapness of the distribution processes available. Yet I know only one newspaper which has told its readers of the availability of a toxic substance of which a total quantity of eight ounces, appropriately distributed, could kill off every human being on our planet, and this is only one item in the biochemists' Chamber of Horrors."

The sole purpose of this statement (which was based on Philip Noel-Baker's authorized quotation from Brock Chisholm) was to arouse public awareness of world dangers other than those of the much publicized nuclear weapons. There is one objective only in all my participations in Pugwash Conferences. It is to aid in making the average citizen (who is the average taxpayer and the average potential victim of global destruction) aware of what is being done in his name, with his money, for his presumed good. I recognize that there are limits to disclosure; I seek to ensure that the limits are carefully considered and publicly justified. I do not accept unquestioningly the shrouded wisdom of "The Establishment" in its decisions on what is good for my average citizen to know. I am quite sure that the shrouding produces dangers not incomparably smaller than those that might follow from complete frankness. One of the penalties of telling the truth, but not the whole truth, is that the teller is suspected of an involuntary, or at least well-intentioned, bending of the wire at the frontier of "nothing but the truth."

"The Establishment," through the mouth of the Minister of Supply in the U.K., chose to deal thus with my somewhat carefully qualified statement: "I think that most of what has been said both by Dr. Chisholm and Sir Robert Watson-Watt has been grossly, indeed ludicrously, exaggerated." He had, however, a few minutes earlier made the doubtfully comforting announcement that, "It is possible that other bacteria or viruses spell a greater danger."

I am informed that a number of Members of Parliament were, as a consequence of my "grossly and indeed ludicrously exaggerated" statement, conducted on a tour of the U.K.'s Microbiological Research Centre and Chemical Defence Experimental Establishment. I am also credibly informed that some of the members felt that they had not, in this tour, come as near as they would have wished to "the truth, the whole truth, and nothing but the truth." I would adapt to this case another established pillar of wisdom. "It is not sufficient that justice be done; it should be manifest that it is being done."

I understand that at some high level in The Establishment it is considered that no one is entitled to a seat in such a Conference as this unless he is or has been a practicing microbiologist. I do not think it has ever been seriously argued that every obstetric surgeon should himself have given birth to a child.

If I may be allowed to speak (for a moment) "off the record," I will say that I have gently been made aware that a request by myself to be allowed to visit the Microbiological Research Centre in the U.K. would not be welcomed, would certainly not be quickly met by permission, and would have a high probability of being rejected.

Returning to the record, I must urge that the minor-official policies, which are illustrated by these simple specimens from one nation, make the tasks of the officials and of the serious-minded citizen alike unnecessarily difficult. They encourage the fermentation of a morass of misrepresentation and misinterpretation which is at once offensive to national and international dignity and dangerous to major national and international policies. That my picture of the morass is not over-painted is, I believe, shown by a half-dozen or so of examples of misinterpretation or misrepresentation.

1. Allegations that United Nations troops launched biological warfare in the Korean War have been interpreted variously as (a) clumsy propaganda inventions, as (b) scientifically incompetent interpretations of inadequate evidence, and as (c) an intelligence finesse to extract, from rebuttals, evidence on the state of preparedness for biological warfare.

2. Suspicions that otherwise unexplained activities in hostilities in South East Asia were in fact secret trials of biological warfare.

3. The fact that the Microbiological Research Centre is carried on the vote of the Ministry of Supply and not of the Ministry of Health is peculiarly vulnerable to misunderstanding or, possibly, to misrepresentation.

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4. A clean sweep, from the bookshops and other places of sale, of copies of a book written in the United States on biological warfare has been publicly alleged by a responsible commentator and the allegation has not (so far as I am informed) been rebutted.

5. The naivete of the Geneva Protocol of 1925 illustrates the dangers of treating biological warfare as a matter primarily for the biologist.

If this Conference did no more than to agree on the most probable explanation or clarification of these particular allegations or assumptions, it would have justified itself. But it can achieve far more. Its chosen field for review is a peculiarly interesting example of the general "dilemma of the scientists" of which I have spoken and written elsewhere. We ought to be able to arrive at an agreed view on the application, in the microbiological and chemical sciences, of the axiom which I have expressed in the mildly frivolous form "The Laws of Nature are not Classifiable." We should be able to sketch roughly the outlines of the "No Man's Land" between these "pure" sciences and that military technology which some of us may regard as temporarily classifiable. So long as our world organization is so rudimentary that mass killing across national frontiers is a permissible pastime, so long may we have to conceal some of the tricks of our trade, some of our technology but none of our science.

We shall fall far short of our duty if we do not add, to the urgently necessary portfolio of "Blueprints for Utopia," a sketch of the vast benefits to the world at large which would result from a pooling of effort in microbiology for peace. This would fit within the framework of that World Health Organization which has already achieved so much under the organizing genius of some of our participants here. Much could be done within the limits of current expenditures, which are largely nugatory because of international secrecies. Even if we have to preface our contribution to the portfolio by drawing a route-map towards a microbiological inferno, this one step alone would be valuable.

War is too serious a matter to be left to the soldiers; survival is too serious a matter to be left to the bureaucrats.

M. M. Dubinin
August 24, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare II. 0

ADDRESS AT OPENING OF THE CONFERENCE

It is a great pleasure for us, the Soviet scientists, to note that this is not the first time that Mr. Cyrus Eaton has so graciously assisted the scientists of various countries to meet together and discuss important problems of concern to the world's peoples. We deeply appreciate this assistance, which bears witness to the high and noble aims of Mr. Eaton with respect to the fate of man, aims of insuring that the high attainments of modern science and technology serve not to bring about the mass destruction of mankind, but to effect a lasting peace and a good life for all.

The urge to peace among Soviet scientists, as among all Soviet peoples, is most clearly reflected in a position which the Soviet Union has maintained over a long period of time with respect to chemical and bacteriological weapons. It would thus seem appropriate at the present Conference to give a short resume of the efforts which our country has made to answer basic questions lying beneath the subject matter of our Conference.

The USSR looks upon chemical and bacteriological weapons as weapons of mass destruction, the use of which is incompatible to the demands of humaneness, social consciousness, and the rules of international law. The Soviet Union was one of the first to ratify the 1925 Geneva Protocol on the prohibition of use in warfare of asphyxiating, poisonous and other gases, and bacteriological materials. The Geneva Protocol, which went into effect in 1928, was ratified by 42 nations, including the USSR, Great Britain, France, Germany, China, Italy, Spain, Canada, India, and others. The USA, Japan and several other nations signed but did not ratify the Geneva Protocol.

As early as the 1920's the Soviet Union brought up the question of how to guarantee a more effective implementation of the Geneva Protocol. Having ratified the Geneva Protocol, the Soviet Union at the same time brought to the attention of the sixth session of the Preparatory Commission on Disarmament, which met in 1929, a proposal that the Commission call upon all states to ratify the above Protocol within the shortest possible time. At the same time, the USSR placed before the Commission a proposal to amplify the Geneva Protocol with a provision that all means and equipment for chemically-based aggression, as well as for biological warfare, which had thus far been issued to troops, held in stock, or which were in production, be destroyed and that establishments manufacturing such material cease their activity. In order to limit the possibilities of infringement of the above disposition, the USSR proposed that a permanent working control be set up in those establishments which could conceivably manufacture materials for chemical and bacteriological warfare with committees of workers from the given factories or trade union organs operating in them.

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The 1925 Geneva Protocol has played an important role in the work of preventing the use of chemical and bacteriological weapons in World War II. After the end of World War II, the Soviet Union came forward decisively to support the prohibition of atomic weapons, as weapons even more dangerous than chemical and bacteriological ones. Beginning in 1946, the Soviet Union has battled in the organs of the United Nations, as well as in various international conferences and meetings, for the prohibition of all forms of weapons capable of producing mass destruction, including nuclear, as well as chemical and bacteriological weapons.

In 1942 the Soviet Union put forward a resolution in the UN Security Council calling for all nations - members of the UN as well as non-members who had not yet ratified or signed the Geneva Protocol - to sign and ratify this protocol.

Unfortunately, among such countries one must include examples such as Japan and the USA, which fact justifiably arouses concern and apprehension in other countries. The fact that the above countries have no legal acts stipulating a prohibition on the manufacture and use of bacteriological and chemical warfare materials, and the resulting arousal of apprehension in other countries, actually stimulates a race to produce these forms of mass-destruction weapons.

And, in point of fact, it is well known to us, the scientists, that by now even more lethal chemical and bacteriological weapons have been created which, in case of a new war, might be used as a means of mass annihilation. At the present Conference the evaluation and analysis of the potentialities of bacteriological and chemical weapons in the light of current scientific and technological developments, taking into account future progress in these fields, allows us to define clearly the degree of danger that these kinds of weapons represent for humanity.

In this connection, the duty of competent scientists in all countries is to inform world social opinion on the degree of danger inherent in chemical and bacteriological means for prosecuting warfare, which is thus far insufficiently made known to all and to call upon all to join actively in the battle against the preparation and use of these means of mass annihilation.

Martin M. Kaplan (United States)
August 24, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare II. 1

Some Epidemiological Considerations of Communicable Diseases of Man and Animals in Biological Warfare

Rosebury in his "Peace or Pestilence" (1949) covers very well the major epidemiological considerations which arise in the potential use of communicable disease agents for biological war (BW). I shall attempt here to amplify only in broad outline certain aspects of these considerations in the light of present knowledge, and to tabulate, for purposes of discussion, the principal diseases of man and animals which appear to be likely choices for BW. Other participants will deal in detail with those requirements (infectivity, communicability, transmission, resistance of agent, immunization, etc.) which would determine the selection of specific diseases for strategical or tactical purposes.

I

A. The Predictability of Epidemics and Numbers of Casualties

While epidemiologists can formulate as generalities the set of circumstances which determine epidemics, the great number of biological variables involved in the host-parasite-environment complex frustrates attempts at quantitative or qualitative prediction. Different aspects of this serious deficiency pertinent to BW can be well illustrated by two contemporary problems. The 1957-58 influenza pandemic was unexpected in almost all respects, except that another pandemic similar in prevalence, if not in mortality, to that of 1918 had been anticipated for many years. Despite the fact that the recent pandemic was the best studied and recorded to date, the knowledge gained will have probably little predictive value for the next pandemic, either in quantitative or qualitative terms. Thus even with a natural event made to order for devotees of BW, who normally would have to depend on the far less satisfactory experimental models they could devise, very little of positive value for their purposes has emerged.

Poliomyelitis illustrates a mass-propogated intestinal infection of natural interest for BW. Although much is known concerning epidemiological factors in polio, the sum of knowledge is of little help for any precise prediction of epidemics, morbidity and mortality. This is attested to by the laborious methods now being used in vaccine studies of polio which include the feeding of strains to small and large population groups, isolation and study of viruses excreted, study of passage in a community and the serological analyses required.

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The use of mathematical probability theory to improve predicatability has met thus far with little success, although work has been meagre in this field. Thus there would be an inability in most instances to predict the number of casualties (morbidity and mortality) in a particular BW attack aimed at starting an epidemic. Also, one of the important pieces of information for BW purposes would be the infecting dose for man of particular microorganisms. At the present time our lack of knowledge of such infective doses forces us to speak in such general terms as "massive" and "minimal" doses with no base-line figure. Extrapolation from LD $_{50}$'s obtained in animals, with all the attendant inaccuracies, is commonly used when estimating infective doses for man. Thus, unless massive doses per capita of infective agents were used in BW, assuring that each individual is exposed to the "adequate" infective dose, quantitative prediction of casualty rates would be hazardous.

For epidemic prediction, stochastic models of "epidemics" seem to work best when only small groups are involved (households, schools, etc.) and fall down when applied to larger population groups. The explanation for failure may lie in the fact that present mathematical formulations are inadequate to deal with the increased number of variables associated with larger groups, and this deficiency remains to be worked out in the future. In the meantime the threshold theorem, quite unsatisfactory for strictly quantitative determination, is often referred to. This theorem asserts that the introduction of infective cases into a community of susceptibles would not cause an epidemic if the density of susceptibles were below a certain critical value; if the critical value were exceeded, the resultant epidemic would reduce the density of susceptibles as far below the threshold as it originally was above.

The lack of precise quantitative tools, however, does not necessarily relegate the prediction of epidemics, morbidity and mortality to the status of a groundless guess. At worst it is an informed guess, and for some diseases strikingly accurate (e.g. measles). For many of the known disease agents sufficient information is available to predict morbidity and mortality in a group of susceptibles exposed to an adequate infective dose. It should therefore be of great interest to this meeting to epply this knowledge to individual diseases most likely to be used in BW. Some order of magnitude would thus be arrived at although the accuracy of such a prediction with respect to mortality would not be comparable to those in the field of nuclear weapons.

It is obvious that many of the quantitative deficiencies discussed previously with respect to human epidemics and casualties need not apply to animal diseases. Precise quantitative determination of infective and lethal doses and epizootiological characteristics can be worked out experimentally.

In summary, we may conclude that for human beings there is insufficient knowledge for prediction of epidemics and numbers of casualties (except where massive doses are employed) and that any national power using infective agents

in BW would act with great imprecision. Such imprecision, apart from its disadvantages for a military weapon, could have grave ecological consequences which will be mentioned later.

B. Variables Concerning the Host and Infective Agent

1. Host

From the standpoint of BW, protection of the host can best be considered in terms of specific resistance to an infecting agent. Such resistance involves the use of immunizing procedures, and attention here will be given only to the production of active immunity. Protection achieved through chemo- or seroprophylaxis is temporary in nature and has limited applicability under the circumstances to be faced in BW. In considering the possible diseases for BW purposes listed in Table 1, it is evident that numerous vaccinal interventions would be required to protect population groups in both the attacking and attacked countries. In addition, the following points are noteworthy:

a. The relative nature of immunity achieved, i.e., overwhelming exposure to an infecting agent can break down the immune barrier achieved with many if not most of the known antigenic preparations. Examples -- brucellosis, tularemia, plague, typhus fever, tuberculosis, typhoid, arbor viruses, influenza.

b. Effective vaccino-prophylaxis is not available for many of the potentially dangerous agents. Examples — coccidioidomycosis, glanders, melioidosis, toxoplasmosis.

c. The limited knowledge available, with a few exceptions, of the effectiveness of multiple antigens administered simultaneously, and the corallary of organizational problems arising through the use of sequential vaccination procedures and their repetition because of short-lived effectiveness.

d. Even though vaccinal protection may be achieved for some diseases, this may apply only to usual routes of entry of the infecting agent, and may not be operative where unusual routes are employed, e.g., the possible development for BW purposes of air-borne dissemination of arbor and polio viruses.

2. Infective Agent

One of the principal aims in BW would be to develop infective agents against which the enemy would be unprepared. The users of these infective agents would presumably have means to protect its population and armed forces. The following considerations emerge:

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a. Since all major powers, and most of the minor ones, undoubtedly possess the standard antigenic strains and knowledge of vaccine and serum production for diseases where immunoprophylaxis is effective, major efforts are probably being made toward selection or production of modified strains of infective agents for both protective and attack purposes. This should be quite possible with recently developed techniques of recombination, selection of mutants, serial and alternating passage techniques, which have been so successfully employed for the improvement of vaccines encompassing the major categories of bacterial, viral and rickettsial agents (example - tuberculosis, brucellsis, anthrax, tularemia, swine erysipelas, influenza, poliomyelitis, rabies, mumps, smallpox, swine fever, rinderpest, sheepox, bluetongue, Newcastle disease, epidemic typhus). We cannot, therefore, depend on known and available antigenic strains for immunoprophylaxis against some of the major disease agents, expecially where there is a natural tendency towards antigenic modification (influenza virus, salmonellae, leptospirae).

b. The development of RNA infective fractions of disease agents (Murray Valley, West Nile, eastern equine, polio, Mengo, Semiiki Forest) may open up entirely new possibilities in the realm of BW, especially if, as appears likely in some instances (foot and mouth disease), immune serum which neutralizes whole virus does not neutralize the purified RNA infective fraction. Nothing more will be said on this subject here as it will be discussed fully by another participant.

c. As F. M. Burnet has pointed out, in addition to the deaths, illnesses and economic destruction resulting from BW, other possible consequences, perhaps more far-reaching in the long run, should not be overlooked. These pertain to disturbance of the fine ecological balances achieved as a result of evolution over eons of time between human, animal and plant life, and between such life and their micro-organisms. Sudden disbalances in numbers, or the insertion of new infective elements into evolutionarily unprepared animal and plant life could, if done to a sufficient degree, produce for an indefinite period an unrecognizable and perhaps unmanageable world from the standpoint of communicable diseases.

II

Known Human and Animal Diseases Potentially Suitable for BW

As a basis for discussion, I have listed in Tables 1 and 2 those known communicable diseases or infective agents of man and animals which could be considered as potentially suitable weapons in BW. Many disease agents in this list are open to question and modification. No attempt will be made here to

discuss the epidemiological characteristics of each, as these are in the main fairly well known. Problems of delivery of the various agents in adequate dosages are very great, and will be considered by other participants. In this connection one point should be kept in mind with respect to arthropod or insect-borne diseases: The causative organism can be considered apart from its vector where air-borne infection is possible, e.g. some of the arbor viruses.

An estimate is included in the tables with respect to the use of infective agents as strategic and/or tactical weapons. As used here, "strategic" implies capability of producing a major effect of widespread proportions either through morbidity, mortality or economic disruption; "tactical" implies usage restricted to selected areas for a limited objective.

Chemo- and seroprophylaxis is included under the head of specific protection available. These would constitute temporary measures and would require repeated administration approximately every month, e. g. repository antibiotic preparations (meningococcal meningitis, streptococcosis) and immune serum or gamma globulin (rubella).

Table 2 on animal diseases should be considered as both potential economic weapons and as a means for attack on human populations by means of the zoonoses (animal diseases transmissible to man).

Groupings of diseases (e. g. arbor viruses, parainfluenza, all known serotypes of leptospirae, bovine mucosal complex) have been made for purposes of simplification, and create ranges of possibilities with respect to specific immunizations available. Thus the characterization of ? to - under specific immunization for typhoid and other salmonelloses would mean that fairly effective vaccines are available for some (typhoid in this instance) and not for others (other salmonelloses).

\+ = suitable

\- = unsuitable

? = questionable, either because of the nature of the agent or insufficient knowledge

* = especially suitable agent

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TABLE 1

HUMAN DISEASES AND INFECTIVE AGENTS FOR BW

	Strategical Use	Tactical Use	Specific Protection Available (including Chemo- and Seroprophylaxis) against presently known strains
A. Bacterial Infections and Intoxications			
*Anthrax	+	+	?
*Botulism	+	+	?
*Brucellosis	+	+	?
Cholera	-	+	?
Dysentery (Bacillary)	-	+	-
Erysipeloid	-	+	+
Diphtheria	-	+	+
*Glanders	+	+	-
Hemophilus Influenza	+	+	-
Leptospirosis	+	+	? to -
Listeriosis	+	+	-
*Melioidosis	+	+	-
Meningococcal Meningitis	+	+	+
Pertussis	-	+	+
Plague	+	+	+ to ?
Pneumococcal Pneumonia	+	+	+
Streptococcosis (Antibiotic Resistant)	+	+	?
Staphylococcosis (Antibiotic Resistant and Exterotoxin Producing)	-	+	-
Trepanematoses	-	+	+
*Tuberculosis	-	+	?
*Tularemia	+	+	?
Typhoid and other Salmonelloses and Shigellosis	?	+	? to -
B. Mycotic Infections			
Blastomycosis	?	+	-

	Strategical Use	Tactical Use	Specific Protection Available (including Chemo- and Seroprophylaxis) against presently known strains
B. Mycotic Infections (cont.)			
*Coccididoidomycosis	+	+	-
Cryptococcosis	?	+	-
Dermatomycoses (various)	-	+	-
Histoplasmosis	?	+	-
Nocardiosis	+	+	-
C. Viral and Rickettsiol Diseases			
*Adenoviruses (some strains)	+	+	?
*Arthropod-Borne Viruses (Eastern, Western, Venezuelan, RSS, St. Louis, Japanese B, Rift Valley, Dengue, Yellow Fever and others)	+	+	+ to -
*Coxackie Group	+	+	-
Echo (some strains)	-	+	-
Infectious Hepatitis	-	?	-
*Influenza	+	+	+ to ?
Lymphocytic Choriomeningitis	+	+	-
Mumps	-	?	+
Parainfluenza Group	?	+	-
Poliomyelitis	+	+	+
Phlebotomus Fever	-	+	- (however, insecticide effective)
*Psittacosis	+	+	?
*Q Fever	+	+	? to -
Rabies	-	+	+ to ?
*Rocky Mountain Spotted Fever	+	+	?
Rubella	-	+	? to -
Scrub Typhus	-	+	- (however, insecticide effective)
Smallpox	-	+	+
*Typhus (Epidemic)	+	+	+ to ?

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	Strategical Use	Tactical Use	Specific Protection Available (including Chemo- and Seroprophylaxis) against presently known strains
D. Protozoal Infections			
Bilharziasis	-	+	-
Dysentery (Amoebic)	-	+	-
Leishmaniasis	-	+	-
Malaria	-	+	+
*Toxoplasmosis	+	+	-
Trypanosomiasis	-	+	?

TABLE 2

ANIMAL DISEASES AND INFECTIVE AGENTS FOR BW

	Strategical Use	Tactical Use	Specific Protection Available Against Presently Known Strains
A. Bacterial Infections and Intoxications			
*Anthrax	+	+	+
*Blackleg and other Clostridial Diseases	+	+	+ to ?
*Brucellosis	+	+	+ to ?
*Botulism	+	+	?
Glanders	-	+	-
Leptospirosis	+	+	? to -
Listeriasis	-	+	-
Pasteurelloses	-	+	? to -
Salmonelloses	-	+	-
Streptococcal and Staphylococcal (antibiotic resistant) Infections	-	+	-
Swine Erysipelas	-	+	+ to ?
*Tuberculosis	+	+	? to -

	Strategical Use	Tactical Use	Specific Protection Available Against Presently Known Strains
B. Mycotic Infections			
Aspergillosis	-	+	-
Blastomylosis	-	+	-
*Coccidioidomycosis	+	+	-
Cryptococcosis	?	+	-
Dermatomycoses (various)	-	+	-
Epizootic Lymphangitis	-	+	-
Histoplasmosis	?	+	-
C. Viral and Rickettsial Disease			
*African Swine Fever	-	+	-
*Arthropod-Borne Viruses (Eastern, Western, Venezuelan, Japanese B, louping-ill, Rift Valley, bluetongue, African horse sickness)	-	+	+ to ?
Borna Disease	-	+	-
Bovine Mucosal Complex	-	+	-
*Bovine Pleuropneumonia	+	+	+ to ?
Chronic Respiratory Disease (Poultry)	-	+	-
Duck Hepatitis	-	+	-
Equine Infectious Abortion	-	+	-
Equine Influenza	-	+	-
*Foot and Mouth Disease	+	+	+ to ?
Fowl Plague	-	+	+ to ?
Fowl Pox	-	+	+
Heartwater	-	+	?
Infectious Laryngo-tracheitis (Fowl)	-	+	+
Infectious Bronchitis (Fowl)	-	+	?
Leukosis Complex (Fowl)	-	+	-
Lumpy Skin Disease	-	+	-
Newcastle Disease	-	+	+
Psittacosis	-	+	-
Q Fever	-	+	? to -
*Rinderpest	+	+	+
*Sheepox	+	+	+

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	Strategical Use	Tactical Use	Specific Protection Available Against Presently Known Strains
C. Viral and Rickettsial Disease (cont.)			
Swinefever	+	+	+
Swine Influenza	-	+	-
*Teschen Disease	-	+	+ to ?
Rift Valley Fever	-	+	+ to ?
*Vesicular Exanthema	-	+	-
*Vesicular Stomatitis	-	+	-
D. Protozoal Diseases			
Anaplasmisis	-	+	-
Babesiasis	-	+	? to -
Coccidiosis	-	+	-
Theileriasis	-	+	? to -
Trypanosomiases	-	+	? to -

CABLEGRAM

MOSCOW, USSR
AUGUST 24, 1959

PUGWASH CONFERENCE OF INTERNATIONAL SCIENTISTS
ON BIOLOGICAL AND CHEMICAL WARFARE
c/o CYRUS EATON
THINKERS' LODGE
PUGWASH, NOVA SCOTIA

DEAR FRIENDS:

IN THE NAME OF THE SOVIET GOVERNMENT, AND PERSONALLY, I WOULD LIKE TO SEND GREETINGS TO THE MEMBERS OF THE PUGWASH CONFERENCE OF SCIENTISTS, MEETING TO STUDY PROBLEMS ARISING FROM THE THREAT TO HUMANITY OF BIOLOGICAL AND CHEMICAL WEAPONS. WE SHARE THE CONCERN OF SCIENTISTS, WHO JUSTLY POINT OUT THAT THE USE OF THESE WEAPONS MAY HAVE NO LESS HORRIBLE A CONSEQUENCE THAN THE USE OF ATOMIC OR HYDROGEN WEAPONS. NOT BY CHANCE WERE CHEMICAL AND BACTERIOLOGICAL WEAPONS CONDEMNED BY MANKIND, AND THEIR MILITARY USE PROHIBITED BY INTERNATIONAL AGREEMENT THROUGH THE GENEVA PROTOCOL OF 1925. AS IS WELL KNOWN, THE SOVIET UNION STRONGLY SUPPORTS THE PROHIBITION OF ALL TYPES OF WEAPONS OF MASS ANNIHILATION, INCLUDING NUCLEAR AS WELL AS CHEMICAL AND BIOLOGICAL WEAPONS. WE HOLD THAT THEIR USE RUNS COUNTER TO HUMANE PRINCIPLES, THE RULES OF INTERNATIONAL LAW AND THE CONSCIENCE OF ALL PEOPLES. YOU, AS AUTHORITATIVE SCIENTISTS, CAN MAKE A SIGNIFICANT CONTRIBUTION IN THE STRUGGLE AGAINST PREPARATIONS FOR WAR EMPLOYING NUCLEAR, CHEMICAL, BIOLOGICAL AND OTHER MASS ANNIHILATION WEAPONS. I WARMLY WISH THE PUGWASH PARTICIPANTS SUCCESS IN THEIR NOBLE WORK.

NIKITA KHRUSHCHEV
CHAIRMAN OF THE USSR COUNCIL OF
MINISTERS

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III.0-2

Pugwash, Nova Scotia
August 25, 1959

Comments by Mr. Cyrus Eaton after Presenting Cable From Premier Khrushchev to the Pugwash Conference on Biological and Chemical Warfare

The cablegram I have just read is significant and important. Premier Khrushchev is the most influential single individual in the world. He heads a proud and powerful nation. I believe that he means what he says. In my conference with him, I was impressed not only with his exceptional ability, but also with his complete sincerity.

In my long business experience, I have dealt with the heads of the most important labor and business organizations in the world. The heads of our great corporations and labor unions in the United States are people of extraordinary acumen. I think I have achieved some success in telling what a man means by the manner in which he says it and how his interests are affected by it. I am convinced that the head of the Soviet Union, for obvious common sense reasons if for nothing else, wants to abandon the enormous expense of armaments for the building of better schools and homes, the improvement of agriculture, the expansion of industry. As a businessman, I consider this only common sense. In my best judgment, Premier Khrushchev means what he says.

What causes me humiliation is the fact that some of my good friends among American statesmen have said to me, "We agree with you 100 per cent in your attitude on crucial international policies, but we lack the courage to speak up. There has been so much propaganda against Communism, we're afraid we will be beaten in the next election if we advocate better understanding with the USSR." It is regrettable to have to say these things, but I am compelled to do so in the interest of humanity.

August 24, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare III.00

Washington, D. C. -- U. S. Senator Wayne Morse stated today in Congress, "My attention has been called to an exceedingly important Conference of Scientists at Pugwash. We shall be watching for the observations made and the conclusions reached by these scientists on biological and chemical warfare, and on what we can do to bring reason to bear before it is too late, by bringing to an end the dangers that any such war would ever be started."

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M. M. Dubinin (Soviet Union)
August 25, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare III. 1

POTENTIALITIES OF CHEMICAL WEAPONS

Mr. Chairman, ladies and gentlemen. Despite primitive means of transmitting poisonous gases to the enemy in the First World War, results obtained in the implementation of chemical weapons at that time proved more effective than those obtained in the use of explosive weapons. The emission of gases from containers, and the shelling of enemy positions with gas-containing projectiles led to the creation of field concentrations ranging from 0.1 to 0.3 mg/l. Moreover, the comparatively low toxicity of the war gases of those days necessitated that people not wearing gas masks be present for ten or fifteen minutes in the contaminated area before developing serious injury.

The employment of skin-affecting poisonous substances such as mustard gas, proved to be more effective. Suffice it to recall that the casualties suffered by the United States Army during the First World War due to mustard gas action made up approximately one-quarter of the total amount of casualties.

By the beginning of the Second World War, the productive capacities and the stock piles of war gases had increased tremendously, particularly in the countries with a high chemical potential. A striking example was fascist Germany. While throughout World War I approximately 40,000 tons of war gases were used on the battlefield, the productive capacity of fascist Germany on the eve of the Second World War was 184,000 tons anually.

The experience of the recent war has shown that Germany had substantially outstripped the Anglo-Saxon countries in developing new and extremely effective war gases. Of the new poisonous substances, Great Britain and the United States had only the DFP (Diisopropilfluorine phosphate). This substance was novel by virtue of its toxic action, but it did not differ greatly from the war gases of World War I as far as the degree of its toxic power was concerned. At the same time Germany possessed highly toxic new phosphoro-organic poisonous substances, namely, Tabun in amounts close to 30,000 tons ready for use in combat, as well as Zarin ready for production with an annual capacity of 7,200 tons. This amount of Zarin is toxically equal to approximately 100,000 tons of mustard gas.

The toxicity of new poisonous substances has immeasurably increased. The inhaling of Zarin vapor is lethal within one to two minutes at field concentrations ranging from 0.1 to 0.3 mg/l; at concentrations of 2-4 mg/l which can be easily obtained for a short duration, one inward breath is sufficient to kill. Zarin also is extremely toxic when affecting man's skin. The absorption of Zarin vapor by the uniform does not exclude the possibility of lesions when the

gas mask is removed inpurified atmosphere, if special measures are not taken.

These quite well-known to all data prove that capabilities of chemical weapons had increased on the eve of the Second World War. Luckily enough they were not employed on the battlefield, which would have most assuredly led to their use against objects in the rear as well; i.e., the civilian population. While the protection of troops would have, in itself, presented quite a problem, one can hardly imagine the incalculable disaster that would have resulted among the civilian population or the huge losses it would have suffered.

Intensive elaboration both of new poisonous warfare agents as well as methods for their use in combat has continued since World War II. As a result, the power of chemical weapons, their capacity to injure and the potentialities for producing poisonous warfare agents, have immeasurably increased. There is no reason to doubt that problems of Zoman - a phosphorous organic poisonous substance - laboratory data upon which has been available since the end of the Second World War, and which has a greater toxicity than Zarin, have been solved both with respect to its industrial manufacturing and to its employment in combat in a number of countries having a highly developed chemical industry.

The recent publication of Tammeline in Acta Chimica Scandinavica proves new accomplishments in the synthesis of poisonous substances with really fantastic toxicity. Some of the substances described by him in the class of ethers of dialkylamino-alkylthiophosphinic acid are lethal when man's skin is exposed to approximately 2 mg. of it. The American press openly advertises the so-called psychic poisons, in particular the derivatives of lysergic acid which cause hallucinations, fear, depression, distorted perceptions, etc. Most likely some of the old war gases such as the mustard gas will also retain practical importance since the combat efficiency of this particular gas has been tested sufficiently broadly under actual conditions.

Together with an improvement in the quality of poisonous warfare agents, the productive capacities of these substances have increased greatly in all countries. This is particularly so for phosphorous organic substances. The total potential productive capacity for poisonous substances in the capitalist countries may be roughly estimated as being equivalent to 500-600 thousand tons annually. This approximate estimate gives a striking idea of the potentialities of chemical weapons and of their menace to mankind.

In a majority of cases the production of poisonous substances is closely related to the civilian chemical industry. This is particularly true with regard to phosphorous organic substitutes. It is known that many countries have a well-developed production of such phosphorous organic insecticides as parathion, systox, malaton and others. It is not particularly difficult to switch the production of these insecticides to the production of phosphorous organic poisonous substances, such as Zarin and Zoman. This leads to great difficulties in imple-

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menting international control of production of poisonous substances. However, with the good will of interested nations, not only these but even greater difficulties can undoubtedly be overcome.

Together with the synthesis of new and very effective poisonous substances and the organization of their mass production, there has been a tremendous increase in the opportunities to deliver them by modern means, and to practically any area within any country. Thus, one modern heavy plane with a payload of 10-15 tons may strike a whole area corresponding approximately to an area destroyable by a medium or a large-calibre atom bomb. Therefore, the potential efficiency of modern chemical weapons is generally comparable to that of atomic weapons.

The employment of chemical weapons against troops and other military objectives would inevitably entail injury and death of a great number of civilians as well. This toll of lives would greatly increase if attempts were made to liquidate the industrial potential of a given country by means of chemical weapons.

Chemical weapons, like atomic weapons, are weapons of mass destruction and, therefore, the inhuman features of both these quite different means of mass destruction are, in general, analogous. If, on the one hand, atomic weapons represent a prime threat to the world, then, on the other hand, chemical weapons, together with bacteriological and biological weapons, also represent a serious danger for mankind. This danger increases proportionately with progress in science and technology and the perfection of these means for prosecuting war.

Soviet scientists, just as all Soviet people, look upon chemical and biological warfare measures as weapons of mass destruction, the use of which is incompatible with the demands of humaneness and the norms of international law. All Soviet people decisively censure exhortations and efforts leading to the spread of preparations for chemical and bacteriological warfare.

Chauncey D. Leake (United States)
August 25, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare III. 2

CONSIDERATION OF "NERVE GASES" AS CHEMICAL WARFARE AGENTS

1. Historical background: Strategic surprise factor in first use of poison gas in warfare by Germans at Ypres, 1915. Strategical back-fire. Tactical disadvantages. Chlorine; lacrimators; vesicants; "mustard" gas, dichloro-diethyl-sulfide; "Lewisite," and volatile organic arsenicals. Gas-mask and clothing protection; decontamination by water and oxidative hydrolysis. Tactical stale-mate and immobilization.

Threats of chemical attacks in World War II. Mixtures. Nitrogen mustards (odorless, colorless irritants). Organic phosphates. Troop and civilian preparedness. Tacit military agreement that use has little value except in surprise attack. Relation to toxic gases from high explosives. Relation to nuclear weaponry. Recognition of the logical fallacies in the concept of "humane warfare."

2. German studies 1940-1945 on organic phosphorus compounds which specifically inhibit cholinesterase, the enzyme (protein complex) regulating transmission of nerve impulses across nerve connections.

a. Background: O. Loewi (1924) found chemical factor in nerve transmission; identified by H. H. Dale as acetylcholine. A powerful drug causing broncho and intestinal constriction, sweating, salivation and convulsions. Ordinarily quickly hydrolyzed (split) in body to acetic acid and choline, which are easily removed and are non-toxic. This splitting is done by enzyme, acetylcholine esterase (AChE), found in all living material.

b. Intensity of drug action depends on dosage, on ratio of rates of absorption and distribution to rate of removal or destruction, on physiochemical properties, and on characteristics of living material.

$$I = (f)\ D\ \frac{rA}{rE},\ P,\ S.$$

c. Choline-esterase inhibitors: Physostigmine, eserine, isolated from Physostigma venenose (African ordeal bean, calabar bean), by Hesse in 1864. Mechanism of cholinergic action shown by Stedman (1931) to be blocking of ChE, allowing accumulation of acetylcholine. Synthetic relatives are neostigmine (prostigmine), the dimethyl carbamate ester of 3-hydroxyphenyl-trimethyl ammonium, and pyridostigmin, and benzkyrinium (stigmonene), all forming white water sol. Crystals with halogens. No warfare value. Pilocarpine, isolated 1875 by Hardy from Brazilian Pilocarpus jaborandi.

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Guoacine compounds isolated from Areca catechn, betel nuts, such as arecoline and arecaidine.
Some of these agents, as physostigmine and neostigmine are used medicinally, by oral administration, for promoting intestinal tone, or muscle tone in myasthenia gravis.

3. The "Nerve Gases": General chemical structure: $O = P - R$; $x = F$ or $C \equiv N$; R = alkyloxy; R_1 = alkyl, alkyloxy, or tertiary amine.

Most are volatile oily liquids, easily dispersed in light oils, absorbed from mucous membranes, slowly hydrolyzed, block ChE in very low concentrations of 0.01 mgm per kg., causing rapid broncho-constriction and convulsions; action prevented or reversed by atropine.

DFP, di-isopropyl-fluoro-phosphate, described in 1932, developed in World War II for anticholine esterase activity. High lipid solubility localizes it quickly in nervous tissue. Peppermint odor, colorless oily liquid, insoluble in water, soluble in oils. In reaction with ChE, F is released, and phosphonium ion forms. Action blocked by atropine. Used medicinally in myasthenia gravis as Isoflurophate USP, or Floropryl.

TEPP, tetra-ethyl pyrophosphate, not stable in air or water; no warfare value.

Hexa ethyl tetra phosphate, mortopal, and tetra ethyl pyrophosphate, vapotone, have high toxicity in water sol, but are unstable. Used as insect sprays on fruit trees.

Parathion, thiophos, Niran, Alkron, yellow oil-sol liquid, as insecticide on fruit trees. No warfare value.

OMPA, Octo methyl pyro-phosphoramide, Pestrox, Schrada, water miscible oil, used as insecticide on plants.

Others are "classified," including very toxic metallic carbonyls.

4. Actions: P is a strong electrophyllic center, reacting more easily with the esteratic (protein) complex of ChE than the electrophyllic carbonyl carbon of acetylcholine, thus making a stable block against the splitting of ACh.

Alkyl phosphates cause death by:

a. excessive stimulation of cholinergic parasympathetic effector cells - a "muscarinic" effect, bringing quick broncho-constriction and acute "lack of breath" with oxygen lack to blood,

b. a "nicotine" stimulation followed by depression of striated muscle, and

c. brain and spinal cord stimulation (convulsions) followed by depression (paralysis).

These effects are due to rapid accumulation of acetylcholine, resulting from blocking its destruction by choline esterase. This phenomenon is prevented or reversed by atropine. Therefore, civilian preparedness against surprise attack by nerve gas must include individual stock-piling of atropine sulfate - dose of 10 mgm. by month - or more.

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Professor P. Thibault (France)
August 25, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare

POTENTIALITIES OF BACTERIA AND THEIR TOXINS

Over recorded time infectious diseases have influenced, sometimes decisively, the outcome of wars. Those of bacterial origin are certainly not the least formidable from the point of view of belligerents. Herodotus bears witness to this in telling of the defeat of the Persian armies by their succumbing to a disease, the description of which points to its being bacillary dysentery; the halting of crusaders, decimated by plague, at the gates of Jerusalem, represents another historical example. In our day, intervention by pathogenic bacteria is less spectacular because of prophylactic measures in general use and of advances in therapy. Nevertheless, one might easily point to recent examples where the omission of these measures and the lack of medicines, either because of lack of foresight or the pressure of events, has allowed epidemics to hinder military operations.

Bacteriologists have stimulated the formulation of hygeinic rules; they have developed the vaccinations that are now given, on a systematic basis, to soldiers of all nations. Many still look with doubt, however, on the possibilities of war involving microbe attacks, and look with skepticism on the statement of a problem which they are loathe to study. For some, this involves certain sentimental reasons that cause them to close their eyes to a grave and imminent danger, while others are intellectually disposed to think that history repeats itself: attempts of the past seem to them of little or no consequence, and the scientific reviews rarely take stock of biological progress, the aim of which might be military aggression.

And yet it is a rule that man uses scientific discoveries to improve and refine methods of destruction.

HISTORICAL REVIEW - Shortly after the first studies of pathogenic germs had been made, Pasteur had the idea of using them in a struggle, a peaceful one to be sure, against harmful animals. He considered the use of "fowl cholera" bacilli (Pasteurella multocida) for the extermination of rabbits, which had been recently introduced into Australia and which were causing great damage. An experiment done in Champagne was successful, but intervention on the part of societies for the protection of animals brought this attempt to a halt, and no one knows what might have been the result of an operation of tremendous scope.

The same idea was to have been tried against other animals. In particular, wide use of baits contaminated with Salmonella (Salmonella entertidis, var. danysz) for the destruction of rats. The multiplicity and incoherence of these limited attempts spoiled their efficacy. Whenever a rational campaign is undertaken, it

generally ends in a success of limited durability. After a delay of one kind or another, the rodents reappeared. This secondary check is explained through immunity phenomena in the survivors, by means of selection of resistant strains, etc. If at any time, however, a similar scourge were to strike a human population whose rhythm of reproduction was considerably inferior to that of rats, it would surely entail prolonged effects.

From 1912 on, there are to be found in legal chronicles several events of criminal nature relating to the intentional infection of a small number of individuals, most often by means of a culture of typhoid bacillus (Salmonella typhi) added to food.

During World War I the outlines of a technique of biological attack began to appear. Enemy agents tried to reproduce the natural mechanism of typhoid fever epidemics by contaminating the water supply or else they tried to spread glanders among remount horses, either by swabbing the excoriated nostrils of several animals with cultures of Malleomyces mallei, or pouring virulent suspensions on the forage.

During the Second World War it appeared that no adversary used bacteriological weapons in the Western theatre. At the most, resistance fighters might have succeeded in provoking a few cases of typhoid among the occupying troops. In the Orient various charges have been made. Thus, epidemic bubonic plague raged in several areas of China, appearing in connection with the flight of aircraft, which could have intentionally dropped rice and fleas lately infected with Pasteurella pestis. The rice could have served to attract rats, which subsequently would have been exposed to insect bites. Whether the incidence of plague was spontaneous or whether it was the result of a hostile act, none of the epidemics were able to modify the outcome of a battle.

In point of fact, bacteriological weapons have been little employed up to now. And whenever they were employed, they succeeded in reaching only very limited objectives, because of insufficient knowledge and lack of proper techniques. However, experimental infectious pathology is making rapid strides. Charges made during recent conflicts bear witness, at least, that the adversary is conscious of the danger.

QUALITIES AND CHOICE IN BACTERIOLOGICAL WEAPONS - The development of this problem was analyzed in 1942 in a report by T. Rosebury and E. A. Kabat, published at the end of the war in 1947. Criteria adopted at this time to discuss the potential value of different infectious agents in bacteriological war are still timely; it is only that it becomes easier to create certain indispensible conditions.

1. A high level of pathogenicity is indispensible. He who would use bacteria as a weapon is faced with the choice of living germs of great virulence, one

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organism of which is capable of creating, if possible, a serious infection and an active toxin requiring an infinitesimal dose.

The use of an attenuated infective agent or an insufficient dose would not only compromise the success of the first attempt, but would run the risk of immunizing the enemy against future attempts.

Those varieties of bacteria that are noted for actively causing laboratory accidents are to be especially retained. Specific examples are bacilli of plague (Pasteurella pestis), tularaemia (Pasteurella tularensis), brucellosis (Brucella melitensis), glanders (Malleomyces mallei), bacillus of melioidosis (Whitmorella pseudomallei); other less dangerous types such as the bacillus of anthrax (Bacillus anthracis) are to be noted for their high spontaneous and experimental virulence to most mammals.

Among the toxins, botulinus toxin is the most potent. Already extremely active in natural form, type A toxin, in purified form, would cause the death of an adult man by a dose of 0.12 micrograms, parenterally.

In choosing the weapon, one must also take into account factors that condition the receptivity of the host; the path of introduction, natural or acquired immunity, hygiene, and the environmental temperature, etc. This is quite possible. The use of an association of microbes or of the adjunction of a chemical substance to lower the resistance are to be considered.

2. The attack should cause infection among the adversary of sufficient number, rapidity of appearance, and duration of evolution to immobilize and disorganize its military or economic potential. Thus, we may exclude disease agents having a long incubatory period, and an evolution either short and benign or chronic from the onset. Thus, infections provoked by enterotoxic Staphylococci are of violent onset but prompt resolution, and are of no interest militarily. Tularemic infections, while often rarely fatal to man, would achieve the aim of putting military forces out of action for a long period of time.

3. The material must be easy to obtain. The culture of bacteria in artificial media easy to handle offers no insurmountable difficulty; methods of mass production are industrially realizable. The handling of dangerous micro-organisms demands only an increase in precautionary measures and the participation of experienced technicians. As far as the storage of harvested material is concerned, taking into account the integrity of its properties, one may accomplish this more easily with spore bacteria (Bacillus anthracis, Clostridium botulinum) than with others, but means known to specialists or freeze drying are largely effective.

4. Resistance qualities of various physical-chemical agents play a role not only while the infectious material is being stored. They must be considered

throughout all stages of their utilization and, in particular, at the time they are dispersed and in the hours immediately following.

Spores provide a maximum in stability. Those of Bacillus anthracis can live in soil for years; they are resistant to a temperature of 100°C. for several minutes in a humid atmosphere and, in a dry environment, to an even higher temperature. Vegatative forms of most bacteria are destroyed rapidly, in a humid atmosphere, by a temperature of 60°C; some are resistant to an external environment for but a short time while others can survive several weeks and even multiply; but their longevity is greatly dependent on the substrata.

By nature toxins are fragile, but botulinus toxin is exceptionally stable. One must heat it 30 minutes at 80°C. to render it inactive; it is destroyed neither by gastric acidity nor by pepsic or pancreatic secretions; it is to this property that it owes its capacity to be injurious when introduced into the digestive tract. The degree of resistance desired by the user of bacteriological weapons depends on his strategic goals and on the methods for using available to him.

5. The means of transmitting infection would not necessarily resemble those of nature if experimentation had uncovered more effective ones. They must be as simple and direct as possible, and open those routes of access to the pathogenic agent which would most favorably enhance its penetration. The ordinary routes are the skin as well as the digestive and respiratory systems.

The cutaneous surface is more a barrier than an entrance, but it is not entirely impenetrable, especially if the integument is injured. Lesions, even when invisible, often suffice to accommodate an accidental or experimental infection; they can be produced or their existence reinforced by projectiles such as shrapnel, chemical substances or parasites. The employment of blood sucking insects to inject bubonic plague or tularemia is a complex procedure that leaves too much to chance. Mucous membranes are open to easy penetration.

The digestive tract is, normally, an important route of infection. It is a route for cholera, typhoid fever, dysentery and botulism. The explosive character of water-borne epidemics is a classical one, but the efficient contamination of main water reservoirs must withstand precautionary measures, which can probably only be applied by military or public health organizations; the contamination of other alimentary products would run up against the same difficulty, and could likely be destroyed by cooking.

The respiratory system offers remarkable access. Many bacteria can easily use it: P. pestis, P. tularensis, Br. melitensis, M. mallei, W. pseudomallei, B. anthracis and others, even if in nature they prefer a different means of access. Aerosols, which in spontaneous epidemics transmitted over considerable distance, are the best answer, could be systematically employed. Large-size particles, about 10 μ in diameter, are generally retained in the upper respiratory tract; they may subsequently pass into the digestive tract or penetrate

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the local epithelium to reach the lymphatics. But smaller particles, the diameter of which is of the order of 1 μ, reach the pulmonary alveoli, a point of departure which is extremely favorable for the invasion of the organism, by whatever means and variable according to the particular bacteria. The physical laws that apply to aerosols are probably known well enough so that they can be successfully employed to accomplish military ends. Times necessary for the sedimentation and survival duration of germs would naturally be a function of environmental conditions, humidity, heat, sunlight, etc.; but to a degree it seems possible to diminish these bactericidal influences.

6. An infection's ability to spread contagiously from one individual to another depends on a number of factors, climatic and social, which are difficult to create artificially. In spite of the high virulence of their etiological agent, we know of very few examples of interhuman contagion for tularemia, brucellosis, glanders or meliodosis; pulmonary plague itself requires certain conditions to become widespread. The epidemic character of the disease brought on would not necessarily be a goal which, in any case, would be of little use if the proportion of persons affected at the outset were quite high.

7. A specific immunization with respect to the biological weapon selected might well be necessary for attacking troops, but the adversary should not gain by being able to use an effective and systematic vaccination or an easy and specific prophylaxis susceptible to rapid implementation.

A botulinus toxin attack would very likely surprise the enemy while the latter was unprotected against it, even though vaccination is possible. An attack by tetanus or diphtheria toxi-infection would have but little chance of success. Anti-microbe vaccinations confer an immunity generally less substantial than antitoxic vaccinations. Some do not exist, others are not capable of withstanding mass contamination.

8. The application of active therapy should be blocked or retarded by every possible means. One might preferably employ either some agent against which there is thus far no known medicine, or a bacteria with either a spontaneous or artificially-created resistance to ordinary chemo-therapeutics or antibiotics.

9. Any way in which the isolation and identification of the introduced microbe can be delayed would further increase the success of an attack. In ordinary practice, it often takes several days to diagnose even a common pathogenic germ. This kind of delay would be too long; diseases such as plague or anthrax, susceptible to immediate antibiotic treatment, evolve towards death after delayed treatment, this treatment being efficient against bacteria but powerless against lesions produced by the toxin. The employment of an infectious agent in an area where it is little known to bacteriologists, its implantation over an unusual route, thus creating an atypical clinical syndrome, would make its determination more difficult. Certain methods presently under study such as spectrophotometry or

the application of fluorescent anti-bodies might possibly reduce the amount of laboratory work necessary.

10. The bacteriological weapon should not reach the user. It is relatively easy to protect personnel whose duties include various manipulations linked to the dissemination of material; for this a corps of specialists, limited in size but suitably equipped, vaccinated or perhaps given chemo-prophylactic treatment, would be required. The protection of personnel assigned to occupy a contaminated area would pose more complex problems; to effect it one must start with the choice of the injurious material which, according to its nature, could be preserved, diffused, caused to disappear or to be rapidly neutralized.

MEANS OF DISSEMINATION - Means for the dissemination of an infectious material are not very numerous. A secret agent (human operative) is the oldest and has remained for a long time the most if not the only, efficient one. He could quite easily conceal a few vials and attain a limited objective, i.e. the contamination of certain water sources, or the food at some military headquarters, or the air-intakes of a subterranean network. He might also attempt the injection of a few human or animal subjects to lay the ground for an epidemic.

Animal vectors could theoretically be used to disseminate plague or tularemia, but success here is faced with numerous obstacles. It would be totally impossible to exert any control over the location of such animals and the number of dead bodies in a limited area would attract attention; the outbreak of an epidemic would require the simultaneous and fortuitous realization of favorable conditions.

Projectiles stuffed with bacteria or bacteriological products could release the latter upon explosion. Because of the rapidity of this action, the escaping heat, the gases, and the wave-shock would have only limited effects upon the germs; their inclusion in suitable supporting media might easily strengthen their resistance. Spore bacteria, anthrax, tetanus and gas gagrene would be the least fragile.

Airplanes or helicopters would seem the mechanism best adapted to the dissemination of material over enemy territory. Various means of introduction might be used and at different altitudes: size of bombs, the parachuting of secret agents or animal vectors and, above all, the aerosol sprays. Atomizers, capable of covering vast areas, under certain conditions, exist, and they have already been put to practical use in the field of agriculture to kill off harmful insects.

Ships might approach coasts, no doubt with difficulty, to spread aerosols. It is not unlikely, however, that a long-range submarine, screened by darkness or fog, might surface several miles from, and disseminate lethal germs over, a near-by town.

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CONCLUSION - If bacterial weapons have not been employed in the past or if they have been employed only on a small scale and without spectacular results, it nevertheless seems that one might distinguish certain types of bacteria possessing the proper characteristics for this kind of employment, as well as an efficient means to deliver pathogenic germs or their toxic products behind enemy lines where they would come into contact with sensitive organisms. Judiciously employed, bacteriological weapons would paralyze the military and economic forces of the adversary, striking both combatants and supporting personnel with death, sickness and terror, both in the zone of military action and in the zone of the interior. Little more is needed to envisage the extreme likelihood of large scale attempts in a future war.

It is true that now we have totally destructive methods, but bacteriological weapons have several advantages over them, at least under certain conditions. They attack only living organisms, thus not affecting industrial equipment. This characteristic would be of value to a future occupying force, both while war is being waged and during the post war period. One might not even contemplate the annihilation of personnel, but only its temporary incapacitation.

The production of bacteria and their derivatives is not costly; it requires neither rare materials nor important installations. Laboratory equipment for the production of vaccines and antibiotics might be taken over and converted.

International control would be difficult to exercise over installations which have so discreet an appearance, and the actual activity of which could be easily concealed. This very character of unobtrusiveness would pinpoint the difficulty of defense, for intelligence furnished by espionage services would likely often be misleading. Intelligence, in the broad sense of the word, is actually a primary condition for protective measures.

The users might, without doubt, defend themselves over the necessary period of time against the backfiring of the weapon used. It would be very difficult for those undergoing an attack, hardly perceptible or not at all perceptible, to find shelter, to put on masks in time and in sufficient quantity, and what is even more difficult, to be specifically immunized. Bacteriological inspection of the air, water and food stocks would very likely furnish information too late, and the same would be true with regard to the analysis of pathological processes.

Claude Dolman (Canada)
August 25, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare IV.2

Historical Comments on the Potentialities of Bacteria and their Toxins

In the past, epidemic diseases have been dreaded more than the wars they have always accompanied and followed. Their mysterious origin, their inexorable, unpredictable spread, and their lethal, disabling and demoralizing effects have often had a greater influence upon history than the outcome of battles. Since the dawn of the bacteriological era, their significance has tended relatively to decline, because control measures have been applied with increasing confidence and success, and because the growing destructiveness of modern armaments has become the overwhelming factor in determining the issue. The negligible role, if any, played by bacteriological warfare in the First and Second World Wars, was largely a consequence of these trends. However, the advent of atomic missiles, which can be delivered intercontinentally, and perhaps before long from extraterrestrial bases, makes it not unreasonable to suppose that war between the great powers could result in every kind of device, including biological agents, being used to hasten the objective - early capitulation of the enemy, before his homeland is completely ruined.

I intend to deal with my topic by first reading a sketchy historical review, which may serve as some sort of comparative background for our deliberations. I propose then, subject to your indulgence, to ask and answer certain relevant questions, which can serve perhaps as points for general discussion.

During the Trojan Wars, according to Homer's Iliad, a priest's daughter, Chryseis, was stolen for bed-fellow by Agamemnon, who would not return her to her father. The latter complained to Apollo, who descended wrathfully from Olympus, seated himself at some distance from the shiploads of Achaeans and their livestock, and proceeded to shoot at them with arrows of unspecified disease from his quiver. First the mules and dogs fell, and then the men, until uncounted fires burned for the dead. After ten days of this the Achaeans had had enough, Agamemnon was persuaded to return the priest's daughter, and the unusual zoonotic outbreak ended.

Not long afterwards, in the time of Samuel, according to the Old Testament, the Israelites were defeated and demoralized in battle by the Philistines, who to boot had captured the sacred ark of the Covenant. As a penalty for this trespass, we are told "the hand of the Lord" smote the Philistines with a plague featuring tumours and mice, which would not let up until the ark was restored to its lawful custodians, bedecked with golden symbolic tumours and mice.

Again, at the time of the Peloponnesian Wars, in 430 B.C., Thucydides describes a sudden pestilence in Athens, which terrified the citizens more than did the Spartans camped outside the walls of their city. Pericles tried to revive

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the war-like spirit of the panic-stricken populace by despatching an army to attack the enemy; but the plague went with the soldiers, and killed more of them than the Spartan spears. An Athenian fleet was also sent out, but had to return with more than a quarter of its sailors dead of the plague. Finally, having lost his sons, his sister, and numerous other relatives, Pericles himself fell victim, and with him perished the Golden Age of Athens.

More recent centuries afford numerous examples of the close relationship between war and disease, in which the latter proved the worse calamity. For instance, towards the end of the 15th century, soon after the return of Columbus from his voyage of discovery to the New World, an epidemic of the great pox (syphilis) swept across Europe, and thence to India and China. It started from a focus in southern Italy, after the army of Charles VIII of France had captured Naples. The soldiers, courtiers and camp followers of the dissolute king acquired the disease from Spanish mercenaries sent to aid the Neapolitans. These troops from Spain were riddled with syphilis, traceable in turn to Columbus' sailors, who had brought it back with them to Barcelona in 1493, having picked it up presumably in Haiti.

About 30 years later, in 1528, Naples was again the epicentre of a devastating pestilence, this time of typhus fever, which destroyed hundreds of thousands of persons in Italy. About 10,000 soldiers of the Emperor Charles V, who was also King of Spain - remnants of a far larger army which had conquered northern Italy and sacked Rome under Philibert, Prince of Orange - were besieged in Naples by the army of Francis I of France, numbering 25,000 men. A sudden epidemic of spotted fever (whose symptoms were described by the contemporary epidemiologist Fracastoro) decimated the French army. Some 4,000 survivors retreated, but were fallen upon and annihilated by the army of the Prince of Orange; and Naples remained a Spanish possession for nearly two centuries thereafter.

The tables were turned, with the help of typhus fever again, a quarter century later. In the winter of 1552, the same Charles (as Holy Roman Emperor) was besieging Metz, with an army of 60,000. The city was defended by only 5 - 6,000 men under the Duc de Guise. Then the spotted fever killed 30,000 of Charles' men, and the imperial army retreated, amid harrowing scenes described by Ambroise Paré, a surgeon in the service of Francis I, still King of France.

Our illustrations need not be confined to the Continent of Europe. Indeed, disease has played a master hand in guiding the destiny of my own country. It has been pointed out that "in 1759, the French could muster only 8,000 troops to defend Quebec, largely owing to the ravages of smallpox. Had modern knowledge of epidemic control been available to the French since the earliest days of colonization, the natural increase in the population would have permitted Montcalm to place an army of 50,000 men in the field, and Canada would probably still be French today." (Heagerty)

A century later, in the Crimean War, the appalling mortality from gangrene and fevers led Florence Nightingale to begin her life-long crusade for better nursing care and sanitation in hospitals. Soon afterwards, in the American Civil War, whole brigades were at times crippled by dysentery; while even in the South African War, Boer bullets caused fewer casualties than the typhoid bacillus, nearly 20 years after it had been identified.

By the time of the First World War, the basic principles of epidemiology and immunology, and the techniques of sanitation, rested on sure foundations; and they were applied with varying success, which depended largely upon the extent to which military exigencies had to supersede the medical officer's regulations, and to which the habits and habitats of the micro-organisms concerned were within his ken. At any rate, the causes of many of the great historical pestilences were now understood, which reduced the sense of helplessness in the face of invisible, intangible malignity. Of course, bacteria still took a heavy toll, particularly in the forms of enteric infections, wound sepsis, tetanus and gas gangrene. But the record would have been far worse save for the laboratory activities, not far behind the fighting front, of such bacteriologists as my old teachers, Almroth Wright and Alexander Fleming. Towards the end of this war, and during its immediate aftermath of malnutrition, overcrowding and dislocation, a pandemic of influenza carried off more than all the war dead, while hundreds of thousands suffered the less spectacular but more prolonged miseries of tuberculosis. Bacteriologists could not avert these disasters, for the influenza viruses and antibiotics were not yet discovered. The main point is that with the knowledge they did have, a start was made, under the sanctions, compulsions and limitations of martial law, towards solving the problems of mass immunization, emergency sanitation, and wound sepsis. The chief objectives of the zealots of this era were to seek out disease-producing microbes, and to eliminate, impede, thwart or tame them. They waged war <u>against</u> pathogenic bacteria, and it is hard to imagine that the possibility of conducting warfare <u>with</u> such agents ever entered their minds.

Even had any efforts directed to that end been seriously considered, they would have been rejected as either superfluous or too hazardous, for more conventional weapons had increased enormously in size, scope and efficiency. The archers, spearmen and pikemen of ancient times gave way very slowly to the mounted lancers and swordsmen of the Middle Ages. In the 19th century, muskets and cannon balls were gradually exchanged for rifles and 10-pounders, and wooden sailing ships for steel ones driven by steam. But the first half of the 20th century saw the techniques of mass homicide "improved" in every way almost beyond belief. Already in the First World War, machine guns, torpedoes and mines, 14-inch gun salvoes from super-dreadnoughts, shelling by Big Bertha from 70 miles away, and bombs falling from the night sky, were among the ingenious new terrors. With such formidable weaponry available, it was unnecessary, and would have been extremely foolish, to drag those rare, dedicated specialists from their prophylactic tasks, and demand that they bend their enthusiasm and esoteric skills to the problems of preparing and delivering agents of bacterial warfare.

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All questions of morality and logistics apart, this was characteristically a war of entrenchment, in which masses of soldiers faced each other at close quarters for months, with small patches of mire changing hands suddenly and frequently. Thus, what might one day be freshly polluted enemy territory was liable to be taken over and occupied next day. When chlorine and other gases were used by both sides in attempts to break the stalemate in Flanders, it was soon noted that they might be blown back if the wind veered. Analogous and more lasting risks would obviously have been entailed had bacterial suspensions been air-borne or soil-seeded in the circumstances then prevailing.

Between the World Wars, microbiology expanded its borders in many directions, and cross-fertilization from allied sciences was bearing fruit. These processes were greatly extended during the war years, and have since continued at an accelerated rate. By the time this new global war had burst upon us, the causal agents of a number of viral and rickettsial diseases had been discovered; important new immunizing products were available, for example diptheria and tetanus toxoids, yellow fever vaccine, and gas gangrene antitoxins; and better antimalarial specifics, and broadly-acting chemo-therapeutic agents, such as the sulpha drugs, were coming on the market. Before long, improved cholera and plague vaccines were being manufactured on a large scale; the remarkable insecticide DDT was developed; and most important of all, fairly soon after Florey and Chain had shown at Oxford in 1940 how penicillin could be concentrated, the golden droplets of "mould juice" which some of us had helped occasionally to glean from small flasks of fungus growing in Fleming's laboratory over 15 years before, were being harvested in thousands of gallons from giant vats in North America. There were also less dramatic, but vital, advances in sanitation. For instance, at home camps the troops often enjoyed safer milk and water supplies than the civilian population; many of them were privileged (as we still are not) to eat food prepared by bacteriologically tested cooks. In the field, the canning industry offered an astounding array of safe comestibles.

Of course, there were plenty of troubles still traceable to micro-organisms. Even after penicillin became available, some wounds still became fatally infected; there were many outbreaks of intestinal diseases, despite chlorination, fly control, and other sanitary precautions; and there were exotic hazards, ranging from poisonous fish to scrub typhus. The health of the civilian population also suffered. Venereal diseases inevitably increased, and various forms of bacterial food poisoning became troublesome. There was always the chance that a polluted water supply might cause a serious outbreak (3,000 cases) of bacillary dysentery in a war industry town, as occurred in Kansas, in 1942; or that an apparently new disease entity would turn up (as in Hawaii, in 1941) putting over 10,000 shipyard workers out of commission for several days with inflamed eyes. Incidentally, the causal agent of "shipyard eye" has only recently been identified as adenovirus type 8. But all things considered, World War II was characterized by fewer casualties and disabilities from microbial diseases than were generally anticipated.

I do not know how much consideration was given by either side to the desirability of launching bacterial warfare, but in my opinion it is doubtful if a decision to do so, in the circumstances then obtaining, would have greatly altered the situation. Presumably any experts who may have been consulted by the authorities were of a similar opinion. After reflecting upon those years from a North American viewpoint, I think it can be claimed that even if it had seemed morally defensible, politically justifiable, and tactically feasible to initiate this type of attack, the trained personnel and engineering facilities required for continuous large-scale production of appropriate weapons were unavailable. The required resources could only have been diverted to this purpose by jettisoning the increased burdens assumed by bacteriological research, manufacturing, and public health laboratories, in their efforts to cope with novel (but "natural") infection hazards encountered by the armed forces, to furnish the vast quantities of needed biological products and penicillin, and to maintain both civilian and military public health at a high level. Such a diversion was at that time clearly indefensible.

Again, there were strategic obstacles to bear in mind, based on the same liability of territory to change hands suddenly, as in the First World War. Whereas then the new occupancy might have resulted from the overnight capture of a trench or two, in the Second World War, islands, archipelagoes, and large land masses were often over-run in a few weeks. In both situations, the victor could find himself tenant of areas which he had deliberately polluted - an awkward perversion of the "scorched earth" policy.

Probably over-riding all these considerations was the obviously swift increase in destructiveness of mechanical armaments - cannonry, tanks, blockbusters and rocket planes - which gave a rather pallid air to the largely conjectural potentialities of biological warfare. The atomic bomb explosions over Japan climaxed this trend, and paradoxically, shattered that illusion.

The proposition which this historical review seems to suggest is that in recent times disease has declined in relative importance as a complication of war, mainly because the destructive power of armaments, and human understanding of infective processes, have both greatly increased, particularly in the last half century, in which the mysteries of the microbiologist's invisible world have been partially bared and put to great advantage. But stripping the veils from the atomic physicist's kind of invisible world, and revealing its awful power for good or evil, have altered the prospects. The threat of atomic weapons and intercontinental missiles in any future war may at first thought seem to relegate communicable diseases to a position still more subordinate, relatively speaking, as a cause of death and destruction. A sounder assumption is that those weapons are of such far-reaching deadliness and adaptability that uncontrollable outbreaks of indigenous and exogenous infections are bound to follow their use, and could be expected to hasten and complete the havoc and demoralization in the areas involved. This claim will be buttressed by a brief consideration of certain pertinent questions.

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Professor Claude Dolman
August 25, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare

QUESTIONS RELATING TO THE POTENTIALITIES OF BACTERIA AND THEIR TOXINS

1. Is it feasible to induce certain diseases in man, animals, and plants by deliberate, artificial introduction of specific pathogenic bacteria or their toxins into the environment?

   Undoubtedly. The results of animal tests, of human volunteer experiments, and of a few known homicidal attempts, are unequivocal.

2. To what extent are the dose and the route of administration important?

   The infective dose of a bacterial culture, or the reactive dose of a toxin, will depend upon the actual agent used, the host species concerned, the degree of non-specific and specific immunity possessed by the host, and above all on the route of administration.

3. Can bacterial cultures and toxins be mass-produced with relative ease on a sufficiently large scale for bacterial warfare purposes?

   Yes. With the same sorts of techniques and apparatus as are used e.g. for the production of antibiotics.

4. Do they deteriorate, or can they be preserved and stored for future emergency use?

   Many of these agents suffer little loss in viability or potency when lyophilized.

5. What mechanisms might best serve for delivering bacteria or toxins over enemy territory?

   Dispersal by: - (i) detonating bombs containing cultures absorbed on to appropriate materials; (ii) aerosols, either alone or combined with smoke or gas clouds; (iii) the hand of saboteurs. Infected insects or rodents offer another, but restricted, possibility.

6. Which of these mechanisms could be used surreptitiously in an undeclared or occult war?

   Small-scale sabotage might prove fairly easy to accomplish and very difficult to verify. An aerosol attack, launched by an off-shore submarine at night, would also be almost impossible to detect. Dispersal methods involving explosives could presumably be ruled out.

7. Might such attacks be very damaging?

   Their nuisance value, through public disturbance and (especially in the case of veterinary disease) through economic losses, might be more than trivial. But most countries would possess, or have access to, the combination of clinical (or veterinary) and laboratory skills needed to identify the disease. Appropriate curative and prophylactic measures would then sooner or later cope with the situation.

8. Could the occurrence of such attacks be demonstrated beyond medico-legal doubt, and their perpetrators be indicted?

   Unless caught red-handed, probably not.

9. Why are the potential dangers of bacterial warfare in a declared war nowadays so much greater?

   Because very large numbers of organisms might be dispersed at great distances from their source, by explosive and other means, over crowded and devastated cities, and over suitable agricultural areas, among persons and animals unable to avoid contact with them, and powerless to procure antidotes.

10. Would not most people be immunized, and are there not antitoxins, antibiotics and other specific remedies and prophylactics, against many of these transmissible diseases?

    Most people are not immunized against the agents most likely to be used in biological warfare, and no effective immunization procedure has been evolved against some of these agents. There are no antitoxins or antibiotics of "universal" coverage, so that until the diagnosis had been confirmed, administration of "specific remedies" would be empirical. Besides, disruption of laboratory facilities, and destruction or inaccessibility of stockpiled pharmaceuticals must be reckoned a likelihood.

11. Could not many of the hazards of exposure to bacteria and their toxins be avoided by relatively simple measures such as boiling food and water, and wearing masks?

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If fuel and receptacles were available for cooking purposes, thorough heating of all material to be taken by mouth would eliminate much of the danger from bacteria and toxins which are effective when ingested. But this precaution would be of no avail against organisms or toxins effective when inhaled; and the respiratory tract is an extraordinarily inviting portal of entry to a wide variety of agents. Masks probably provide very inefficient protection.

12. What are logically some of the most important attributes of pathogenic organisms as candidates for biological warfare?

The organisms should be relatively resistant to physical agencies; protection against them by previous immunization should not be widely practiced or easily induced; avoidance of them by simple sanitary precautions should not be feasible; infection should be acquired by several alternative routes; the incubation period should be short; the symptoms should be puzzling and varied; the infectivity for others should be of long duration and high intensity; and preferably, they should be capable of infecting animals as well as man.

13. Would an attacker not be exposed to recoil, boomerang or retroactive infection hazards?

Not with bombs as vehicles; nor even in an aerosol attack, provided the wind blew in the right direction.

14. But when he came to occupy the infected territory, what them?

He would know what he faced, and govern himself accordingly. The precautions are in many aspects analogous to those necessary when occupying areas suspected of residual radio-activity.

15. In the long run, would any lasting advantage have been gained from biological warfare by the victor?

Of course not.

André Lwoff (France)
August 25, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare IV. 4

THEORETICAL POSSIBILITY OF SELECTING INFECTIOUS DISEASE AGENTS FOR BIOLOGICAL WARFARE

An infectious pathogenic agent is an entity able to produce a disease. The ability to produce a disease however is only a potential property, for a disease is the result of the interaction of the host and of the parasite.

An homogenous culture of a pathogenic microbe or of a virus is injected into an animal and develops. The importance of the disease may vary to a considerable extent: the infection may be symptomless, or the disease may be mild or severe and, if severe, a more or less important fraction of the animals may die. In a number of cases, it is possible to modify the state of the host in such a way that the infection will be mild, severe or fatal.

With certain strains, however, the infection is always fatal and these strains are called highly virulent. It has been known for a long time that the virulence of pathogenic species may vary within considerable limits. And long before bacterial genetics was born as a science, that is long before geneticists understood what bacteriologists were doing, it was possible to obtain strains of low or high virulence. Thus, by subculturing for years a certain bovine strain of the Koch's bacillus on potatoes which had been boiled in beef's bile, a strain of low virulence was obtained which is the BCG vaccine.

The problem to be discussed this morning is the selection of highly virulent strains. The simplest and oldest way of selecting virulent strains of a pathogenic species is: a) to start with a strain isolated from an animal exhibiting an acute disease, b) to passage this strain serially and to select each time the animal developing the most rapidly, the most severe symptoms. Moreover, by picking up bacteria systematically in a given organ, for example the lung, strains particularly virulent for this organ can be obtained. This procedure can be applied to bacteria as well as to viruses.

So far as viruses are concerned, a new method has been recently developed. By growing poliovirus at high temperatures, that is 41°C, highly neurovirulent strains have been obtained. It is, therefore, theoretically possible, by using the right selection pressure, to select highly pathogenic strains of a large number of bacteria and viruses. And it is, or certainly will be possible, to select infectious agents able to produce a severe or fatal disease when reaching the eye or the respiratory mucosae. These agents would be suitable for biological warfare.

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The increase of virulence during any process of selection is known to be the result of the selection of mutants produced spontaneously at random. The treatment of a bacterial or of a viral population with certain agents increases the mutation rate. Certain mutagenic agents seem to induce more readily a given type of mutation than others. But no way of inducing specifically a given mutation is known for the time being.

It is also theoretically possible to confere virulence to a non-virulent bacterium by introducing with the genetic material the adequate "pathogenic" information from a virulent strain. This could be done either by conjugation, or by transformation or by transduction, but has not yet been performed.

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I have considered up to now the system infecting agent infected host left by itself. But the course of an infection can be modified by a number of agents such as antibiotics. Microbes can develop high levels of resistance against antibiotics. This resistance is known to be the consequence of mutations and resistant mutants are easily isolated when the antibiotics serve as a selective agent. This can be done purposely or not. In hospitals where penicillin is used extensively, penicillin-resistant staphylococci are frequently selected and become a nuisance. By the systematic stepwise in vitro action of number of antibiotics multiresistant strains can be obtained. Not having been involved in bacteriological warfare I am able to disclose that in certain secret places strains of anthrax have been secretly produced which are resistant against most antibiotics and are thus highly suitable for biological warfare.

To obtain virulent strains of a large variety of infectious agents is therefore easy. To obtain virulent strains able to resist therapeutic agents is also easy.

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In nature, when a bacterium or an infectious agent is too virulent, it necessarily disappears when it has killed all its sensitive hosts. A balance is established which involves the selection of more or less resistant hosts and of infectious agents of "relatively" low virulence.

But a relatively low virulence might be still high. The low virulent strain of myxoma kills 60 p. 100 of the infected rabbits. And some of the infectious agents which have been selected by natural selection kill 20 to 60 p. 100 of the human beings: such are the agents of plague, cholera or small pox.

Nowadays epidemies do not develop in human beings for many reasons: 1) Because the sensitive hosts are made resistant by vaccination, 2) because the disease is rapidly diagnosed and cured and the patient anyhow isolated and thus prevented to spread the infection, 3) because the vectors or intermediary hosts or the reservoir are systematically destroyed.

It is clear that by putting at work proper ways of selection strains of infectious agents can be obtained which overcome the obstacles which have been so successfully opposed to their activity.

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A. A. Smorodintsev
August 26, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare

MICROBIOLOGY AND BACTERIOLOGICAL WARFARE

During the brief period of its development - less than 100 years - microbiology has invariably personified the finest features of man's genius in its ceaseless penetration into the secrets of the microbial world, acting always to benefit human beings everywhere. From the first discoveries of Louis Pasteur - the brilliant founder of microbiology - up to the present day, great and noble tasks have been inscribed on the banner of microbiological science: harnessing the uncontrolled forces of the microbial world, the elimination of contagious diseases, prolongation of human life, the saving of millions of children dying from grave infections, raising crop yields, and developing the industry and the economic welfare of the peoples.

The persistent labors of several generations of microbiologists - humanitarians in the science of many countries - have borne fruit in abundance. By the beginning of this century, the outstanding role played by microbes in the cycle of nitrogen, carbon and other substances in nature was an established fact. Microbes were known to be basic to the life of plants and animals, microorganisms had played a prominent part in the geological development of our planet, microbes were exceedingly important in medicine, agriculture and the food industry. The useful activities of microbes were put to use in the production of valuable soil fertilizers, in the making of bread, wine, beer and other food products, in the manufacture of textiles and medicinal preparations of the antibiotic type that have saved millions of human lives.

Persistent studies of the agents of contagious diseases, their properties and the sources from which they spread have armed medical microbiology, epidemiology and hygiene with highly important methods for the partial or total elimination of the most dangerous infections. The extensive list of such vanquished human diseases already contains the plague, cholera, yellow fever, malaria, intestinal infections, and typhus fevers. Utilizing cultures of contagious diseases, viruses and rickettsiae, microbiologists have learned to convert them into killed or living vaccines, and the most potent bacterial poisons into antitoxins, which create in the inoculated population an artificial immunity to the extremely dangerous agents of smallpox, diphtheria, tetanus, yellow fever, typhus, poliomyelitis, epidemic parotitis (mumps), and virus encephalitides.

The advance against contagious diseases made during the past 30 to 40 years has radically improved the health of the population of many economically advanced countries in Europe, North America, Asia, and Australia, and has reduced tens of times or even totally eliminated the incidence and mortality of a number of dangerous infections prevalent in the nineteenth century. This has brought about a sharp cut in the death rate and a steep rise in the average human life-span in these countries.

Progressive scientists the world over are actively working to bring the attainments in the field of combatting contagious diseases to the hundreds of millions of inhabitants in the economically underdeveloped countries of Africa, South America and Asia, which are still making great sacrifices to diseases that modern science has already conquered.

In the Soviet Union, a broad offensive against contagious diseases was begun immediately after the victory of the October Revolution in 1917, which placed in the hands of the people, formerly oppressed by the despotism of tsarism, the great achievements of medical science. As early as 1930, many dangerous infections that had gained a foothold over extensive areas of tsarist Russia were vanquished and eliminated. Young Soviet physicians have now only book knowledge of such diseases as plague, smallpox, cholera, and relapsing fever, for they have disappeared entirely. At the present time, malaria, trachoma, syphilis, and gonorrhea are close to total extinction. The incidence of diphtheria, typhoid fever, tularemia, and brucellosis has been reduced to a minimum.

The scientific careers of microbiologist physicians are illuminated by unforgettable feats. Many of them gave up their lives and health in the study of the nature of new contagious diseases and means of fighting them. Science honors the memory of Walter Reed - courageous fighter against the yellow fever, of Ricketts and Prowazek, who died while studying typhus fever, of many scientists and laboratory workers who died while studying pest, tick-borne encephalitis in the USSR and the USA, and of those who became infected with and died from the herpes B virus while producing vaccines against poliomyelitis in the United States, Great Britain, and Canada. In our country, there have been numerous cases of self-infection when scientists were engaged in studying the etiology of infectious diseases.

In 1970, the Russian microbiologist G. Minkh became gravely ill when he infected himself with the spirochete-containing blood of a relapsing-fever patient and proved for the first time the role of spirochetes as agents of this infection. In the same year, Professor Mochutkovsky carried out a similar experiment on himself with the blood of a typhus patient. I. I. Mechnikov infected himself with the culture of a cholera vibrio. D. K. Zabolotny exhibited extraordinary courage in the study of plague in Mongolia and India. The goal that inspired the noble doings of these courageous people was the health of human beings, the happiness of mankind.

In the general progress of microbiological science during recent years, particularly outstanding (as to theoretical value and tremendous practical potential) are the fundamental investigations in the field of viruses and the numerous diseases that they produce in man, livestock, wild animals, plants and microorganisms (bacteriophagia).

Three examples may serve to illustrate the remarkable successes of theoretical and applied virology. The first refers to the study of the nature of virus

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reproduction. All viruses, irrespective of the complexity of their morphological structure, possess the most important features of life and are something like a model of the most elemental forms of life on the earth. It is not surprising then that this intriguing model of living matter, which makes possible a very precise quantitative analysis of the process of its reproduction, turned out during recent decades to be the object of special attention on the part of many leading biochemists, physico-chemists and biologists, who have discovered in viruses highly peculiar mechanisms of reproduction.

The latter proceed with basic participation of virus nucleic acids, which even in a state of highest purification possess active infectious properties and an aggregate of the most important hereditary peculiarities of the given agent. The virus nucleic acids enter the inner media of susceptible cells and perform active parasitic functions by transferring the processes of the synthesis of constitutional nucleoproteins of the host cells to the reproduction of virus nucleoporteins. Depending on the intensity and rates of this parasitic process engendered by the virus nucleic acid, the cell involved can rapidly disintegrate or can adapt itself for a long time to the new conditions, all the time giving up a part of its building resources to the reproduction of virus nucleoproteins foreign to the cell. The discovery of a complex cycle of virus reproduction requires the creation of new concepts in the field of genetics and the pathogenesis of virus infections, and opens up promising vistas for more radical control of the processes of virus variability.

The second case has to do with explosive progress in the etiology of many virus infections of human beings, which even 10 years ago were inaccessible to investigation due to the immunity of various laboratory animals to this group of agents. The discovery of the cytopathogenic activity of viruses in tissue cultures carried out in the laboratory of John Enders has put at the disposal of virology entirely new methodological possibilities for disclosing the virus etiology of dozens of little known or earlier totally unknown mass ailments of the group of respiratory, intestinal and children's droplet infections. On the theoretical basis of this discovery there has occurred a veritable revolution in practical methods of laboratory diagnostics and the mass reproduction of virus agents, which are so important for the making of new killed or living vaccines and diagnostic preparations.

The third case is connected with increasing and fruitful efforts of virologists of different countries to confine the spread of a number of mass infections of humans and to wipe out the reservoirs of agents among the population by means of active immunization with killed and particularly living vaccines. Through the use of new technical possibilities for intense reproduction of virus agents in tissue cultures with an optimal nutrient medium and also in developing chick embryos, it has been possible to create valuable killed vaccines against polyomyelitis, aphtha of livestock, and, to some extent, influenza. Refined methods of attenuation of pathogenic viruses and the possibility of enriching vaccine strains

in modern tissue cultures have opened up ways of obtaining more effective living vaccines against poliomyelitis, influenza and other respiratory virus infections, measles, epidemic parotitis, and transmitted virus encephalitides.

The outlook in the development of general, medical, veterinary and plant virology is truly breath-taking and is including an ever larger number of fundamental problems of a theoretical and applied nature. Here belong problems of the etiology of malignant tumours in man on important problems coming increasingly under the influence of medical virologists; the isolation of viruses of epidemic hepatitis, hemorrhagic fevers and many other illnesses whose etiologies have not been sufficiently studied; the further development of problems of the etiology, epidemiology and methods of combating the more widespread virus diseases of the group of respiratory, intestinal and anthropod-borne infections, and many other highly important problems.

At the historic trial at Nuremberg, Hitler's accomplices were convicted and executed for grave crimes against humanity. The peoples of all countries are full of hope that justice will triumph, that the future holds a calm and peaceful life without the horrors of war, which the great Russian physiologist Pavlov called "a savage method of solving life's difficulties that is not worthy of the human mind with its limitless resources." These hopes are still far from realization and are darkened by the spectre of a new world war with the use of the destructive atomic weapon, which threatens mankind with mass physical extermination.

The logical development of atomic warfare is found in the not less brutal and destructive plans for a biological war and the mass extermination of the population in areas not so well suited to the use of atomic and hydrogen bombs. The chief aim of the biological weapon is to bring to the far rear of the enemy exceedingly dangerous agents of infectious diseases capable of killing or crippling those infected and of bringing about epidemics that would disorganize the social and economic life and spread panic and fear among the peaceful inhabitants. The ideologists of biological warfare see advantages in the negligible cost of producing a microbial weapon and in its ability to crush the resistance of an enemy without destroying the economy of the country. Biological warfare is directed mainly against the life of the peaceful population and against the sources of food (livestock and crops); it does not destroy buildings and machines and is therefore regarded by its military adherents as the best method of capturing territory freed of its population but with the material values intact.

Bacteriological warfare directs against the lives of humans the great attainments of microbiology that have been created by an enormous army of scientists for the purpose of wiping out infectious disease from the face of the earth. In their savage plans to kill off as quickly and cheaply as possible millions of human beings - the bearers of all spiritual and material values - the specialists in bacteriological war strive to sow despair and horror and to plunge the peoples

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of this earth into the Dark Ages with their terrible epidemics of lung plague, smallpox and cholera. They forget that biological war, like atomic war, is suicide for the country that begins it, since the means of bacteriological attack are well known and can in short order be directed against the aggressor who has taken up this terrible sword. It is no accident that even Hitler and his criminal generals did not dare begin a biological war, for they were full aware that the danger cuts both ways.

The scientific principles of bacteriological warfare are based on the attainments of modern microbiology and epidemiology that are utilized for purposes which are the direct opposite of those of medical science - the infliction of maximum harm to the health of the enemy population. In this, use is made of existing knowledge concerning the degree of pathogenicity and contagiousness of different agents, and methods of penetration into and elimination from the human organism. Use is made of methods of intensifying the pathogenic properties and their preservation for laboratory cultures and mass production, methods of cultivation of the more convenient agents ensuring their maximum and rapid reproduction under the simplest production conditions, and also the use of selected bacteria and viruses for their dissemination via infected air, sources of water and bloodsucking carriers.

We scientists can form some sort of a mental picture of the principal requirements in the selection of a bacteriological weapon and the tactics of its application against the population judging by the experience gained in studying epidemic diseases of man.

1. Priority in preparing for bacteriological warfare will go to highly pathogenic agents that give rise to the mass-scale development of severe diseases of high lethality, which are readily transmitted from stricken persons to others that come in contact with them, and that develop multiple foci around the primary cases.

2. Among the highly pathogenic and contagious agents, a particularly important place will be given to microbes and viruses that infect humans by aerial pathways with subsequent development of infections of the respiratory and intestinal tracts, the central nervous system (virus encephalitides), and other systems of the organism. The main tactical condition in the successful utilization of a bacteriological weapon is the advantage and accessibility of the aerial medium for direct contamination by aircraft or rockets, thus making for dangerous, rapid and effective dissemination of agents of disease over a specific territory with large centers of population on transportation lines with heavy traffic.

Of subsidiary importance especially in subtropical and tropical countries is the dropping of bloodsucking carriers for contamination of humans and livestock and the building up of foci of appropriate arthropod-borne infections.

3. These military measures are based on the utilization of microbes and viruses with enhanced resistance to temperature factors, dessication, etc., which may be simplified by the selection of a preserving medium and accurate calculations of the motion and distribution of aerosol clouds depending on the height of their development, the meteorological conditions, the speed of the aircraft and other particulars that are determined beforehand experimentally with harmless indicator microbes.

4. To enhance the activity of the bacteriological weapon, to mask the nature of the agents and to complicate methods of combatting them, use will be made of diverse combinations of bacterial and virus agents that will aggravate the disease and guarantee considerable regularity in the effect of attacks. Very well known, for example, is the malignant course of many bacterial infections of the lower respiratory tract that develop in association with respiratory viruses.

If we take into account the multiplicity of bacterial, virus and rickettsial agents suited for purposes of bacteriological warfare, it is easy to imagine the different associations among them that could enhance the effectiveness of a bacteriological weapon.

5. The selection of concrete agents for biological warfare against a population will depend on the epidemiological peculiarities of the enemy country and the state of immunity of the population to agents suitable as a bacteriological weapon. Priority will be given to agents that are not encountered on the enemy territory, agents that are new to science and only recently discovered, agents that do not leave a state of immunity after them; that is, such that are less accessible to means of specific protection.

6. Bacteria and viruses used for bacteriological warfare should belong to species that multiply readily in the simplest culture media or tissue cultures. Considering the large volumes of material dispersed at one time (they amount to 10 and more tons per operational flight), it will be necessary to prepare quantities in the range of thousands of tons. The enormous modern tanks used in the preparation of microbial masses for the production of antibiotics will probably be the prototype apparatus for media used to prepare pathogenic bacteria; while stainless steel tanks and the constantly growing suspended cultures of malignant cells of human tissues or chick embryo will serve as a model for the preparation of virus and rickettsial agents.

The outward appearance of these "preparations" will be simple in the extreme and will be a far cry from the elegantly packed bottles and ampules that today contain vaccines and antibiotics. The bacterial or viral suspensions containing millions of active particles per millilitre will be pumped like beer from huge tanks through cooled pipes into the "camp cellars of death." From there, the selected combination of bacteria and viruses (in the form of a turbid

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liquid) will flow to the tanks of aircraft that will be equipped with apparatus to maintain constant temperatures while the suspensions are delivered to the site of their aerosol pulverization. This will be effected late in the night (as is usual for all kinds of criminal activities) so that by sunrise the disease-carrying particles will have reached the ground, enveloped the streets and seeped into the homes to meet their enemies - our children and wives.

Such is the terrifying finale that is being prepared for the most humanitarian of sciences - microbiology; such is the fate that awaits this and future generations if an end is not put to war as a means not permissible in the solution of political and any other differences. Man - the master and adornment of our earth - is now under the threat of physical extermination. The conscience and honor of the peoples, their collective will, will not permit this threat and will put an end to all wars, big and small.

The microbiologists of the USSR have expressed great satisfaction for the repeated and categoric decisions of the Soviet Government on the prohibition of the use of chemical and bacteriological warfare as a means for the mass annihilation of mankind, an event that would deny the most elemental humane conceptions, social consciousness as well as the norms of international law. Our government is one of the first to ratify the Geneva Protocol of 1925 on the prohibition of the use of chemical and bacteriological measures in warfare, and has repeatedly urged all nations that have not yet joined or ratified the Geneva Protocol to take action on the prohibition of the use of such important weapons. Microbiologists of all nations must exert their scientific and social authority to censure their governments and prohibit them from using measures for bacteriological warfare.

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POTENTIALITIES OF RESPIRATORY VIRUSES

Respiratory infections constitute an important infectious disease problem throughout the world. Respiratory infections are a major cause of morbidity, and for this reason they are of considerable economic and social significance, particularly in the more highly developed countries with big industries and a dense population.

Most of the respiratory infections are probably caused by viruses. New respiratory viruses are recognized almost every month, but in spite of much research, the etiology of the majority of respiratory infections is still unknown.

In my introductory remarks I shall first briefly describe the more important of the known respiratory viruses, the diseases they produce and some of their properties, and thereafter discuss their potentialities as a biological warfare weapon.

Most of the known respiratory viruses belong to one of the following four groups or families: the influenza viruses, the para-influenza viruses, the adenoviruses and the common cold.

The influenza family comprises a large number of virus strains. There are three different antigenic types: influenza A, influenza B, and influenza C. This, however, is only a "main-grouping." The influenza viruses - particularly those belong to the A type - possess a pronounced antigenic lability characterized by minor antigenic variations from year to year and by major changes which seem to happen at intervals of 10 years or more. Since the first influenza A virus was isolated in 1933, two such major changes have occurred, the first in 1947 and the second in 1957. For this reason the type A is divided into three sub-groups: sub-group A-0, consisting of the influenza A strains isolated up to 1946; sub-group A-1, comprising those strains which were predominant from 1947 to 1957; and sub-group A-2, the strains isolated since 1957, when the so-called Asian influenza appeared.

This sub-grouping of the influenza A viruses illustrates the complexity of this virus group, but it does not tell the whole story. As mentioned, minor antigenic variations occur frequently, and there may be considerable antigenic differences between two strains isolated in two different years even though they belong to the same sub-group. The influenza A group is thus a very large family comprising many different members.

The influenza B viruses also vary in their antigenic makeup, but to a lesser extent than is the case with influenza A. Influenza C virus, on the

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other hand, seems to keep its antigenic constitution unchanged.

The second family of respiratory viruses is the so-called para-influenza group, which comprises three antigenic groups designated para-influenza virus types 1, 2 and 3. The first of the para-influenza viruses was isolated in 1953, the second in 1955, and the third type in 1958. These agents have certain characteristics common with the true influenza viruses, but they are antigenically distinct from these viruses. The knowledge about the para-influenza viruses is at the present time only fragmentary.

The first strain of the third group of respiratory viruses - which is now called the adenoviruses - was isolated in 1953, and not less than 18 different serotypes are known by now. Seven of these types have been isolated more or less accidentally from apparently healthy human beings, and their relationship to human disease is unknown. The remaining 11 types have been isolated frequently from cases of respiratory or ocular infection, and their etiologic importance for these infections has been definitely established. The adenoviruses are quite distinct from the influenza and para-influenza viruses, and although the adenoviruses show a common complement-fixing antigen, the individual types differ so much in their antigenic constitution that they might as well be considered to represent as many different virus groups.

Only little can be said about the fourth virus group, the common cold viruses. Although it was shown as early as 1914 that common cold could be transmitted to volunteers with bacteria-free filtrates of nasal secretions from a person with common cold, all attempts to grow this virus in the laboratory seem to have failed, and the present knowledge of the common cold is, therefore, still very limited.

The different respiratory viruses may give rise to very similar clinical illnesses, and most often it is not possible from the clinical picture alone to determine which one of the different agents is the etiologic factor. Broadly speaking, the symptoms caused by the respiratory viruses may be divided into local and general symptoms. The local symptoms are those of an inflammation of the mucous membranes of the respiratory system and frequently also the eyes. If the local symptoms predominate, the doctor will probably classify the disease according to the anatomical sight of the infection, i.e., as rhinitis, pharyngitis, bronchitis, pneumonia, etc.

The general symptoms are those of fever, malaise, headache, sometimes gastro-intestinal symptoms, and in severe cases - which are fortunately rare - symptoms of general intoxication with involvement of the central nervous system or circulatory disturbances. Cases with predominating general symptoms are likely to be diagnosed as influenza, influenza-like disease, or febrile catarrh. While local symptoms are most pronounced in infections with common cold viruses, the influenza and para-influenza viruses and at least some of the

adenoviruses may give rise to both local and general symptoms and to severe as well as to very trivial infections, and as mentioned previously, it is usually not possible to determine at the sickbed which one of the different viruses is the etiologic agent.

While the different respiratory viruses may induce identical clinical illnesses, there are important differences in their epidemiological behavior. Thus the influenza A and B viruses most frequently give rise to extensive epidemics, and are very seldom isolated from sporadic cases of respiratory disease. In contrast, the influenza C virus, some of the adenoviruses and the para-influenza viruses only cause smaller epidemic outbreaks, particularly in young people living under crowded conditions - as in schools, military establishments, etc., or they are isolated from sporadic cases of febrile catarrh, influenza-like disease or acute pharyngitis, etc.

Concerning the properties of the various respiratory viruses, it should be mentioned that they are all, with one exception - the common cold viruses - fairly easy to cultivate in the laboratory, either in the embryonated egg or in tissue cultures. The influenza virus may be transferred to a few species of laboratory animal, but for the adeno- and para-influenza viruses, no other animal host than man is known. As regards stability, the respiratory viruses will remain infective for a long period of time if kept in the cold, but they are fairly rapidly destroyed at room temperature or higher temperatures.

After this short survey on some of the more important characteristics of the known respiratory viruses, let us consider briefly the potentialities of these agents as biological weapons. By definition, biological warfare is the intentional use of living micro-organisms or their toxic products for the purpose of destroying or reducing the military effectiveness of man. Respiratory viruses do not produce toxic virus-free substances, and may consequently be effective biological weapons only if they produce an infection. Obviously then, an aggressor will try to wage bacteriological warfare with a respiratory virus only if he feels convinced that this virus will cause significant disease, the infectivity and the virulence of the agent for man is the property of primary importance. Of particular importance is also the capacity of the agent to spread in the population, since this would obviously greatly magnify the effect of the initial attack.

Certain other characteristics are also required to make an agent suitable as a bacteriological warfare weapon. The infectious organism should, for example, be fairly stable in order to stand dissemination without being destroyed, and it should be easy to grow on at least a semi-large scale in the laboratory. Finally, it should be an agent towards which the immunity in the target population - whether acquired or naturally induced - is of a low grade.

The question is then: do the respiratory viruses meet these requirements? As mentioned before, all attempts to grow one of the four groups - the common cold viruses - have so far failed, and this group may therefore be excluded from

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further consideration. The remaining three virus groups fulfill the requirement of being easy to cultivate, and although they do not belong to the stable viruses, it would probably be technically possible to provide for their dissemination without excessive destruction.

In considering adenoviruses or para-influenza viruses as a biological warfare weapon, an aggressor would probably bear in mind that these viruses are circulating all over the world. The immunity is of a high level in most adult populations, and epidemic outbreaks are consequently seen mostly in children or in young persons living under special crowded circumstances, as in camps and military establishments.

Even if it should be possible to introduce the disease in the target population, the result would probably be only a limited outbreak - because of the widespread immunity - of a mild disease of very short duration. Neither the adeno- nor the para-influenza appear promising as effective biological warfare weapons.

After these exclusions, we are left with a consideration of the influenza viruses. Immunity against influenza appears to be very short-lasting, and the influenza A and B viruses have with few-years intervals demonstrated their capacity to produce large epidemics. Therefore, if such an epidemic could be deliberately introduced behind the enemy's lines, the high simultaneous morbidity and the fatal cases which may often take a dramatic fulminant course, would certainly by its physical as well as by its psychological effect greatly incapacitate the civilian life and the military efforts of the opposing nation.

However, even under natural circumstances influenza epidemics frequently run an erratic course. In some instances the epidemic spread logically follows the roads of communication. In other cases, however, the epidemic remains localized to certain areas, and a spread to adjoining areas does not occur or it takes place only after a long lag period. We have at the present time no explanation for these variations in the epedemiological behavior, and how an "artificial" epidemic induced by man would behave, no one can answer.

Quite irrespective of whether an epidemic could be initiated or not, the question must be considered whether it is at all possible to infect man artificially with influenza virus and to produce a disease of sufficient severity for purposes of biological warfare. Contemporary evidence strongly indicates that this is not the case. When influenza viruses are grown in the laboratory, their infectivity and virulence for man is usually lost or at least greatly diminished, even after only a few passages in embryonated eggs or in tissue culture. This has been shown by innoculation of such virus material into human volunteers, and it is further substantiated by the fact that laboratory infections with influenza virus are extremely rare. Obviously such attenuated virus strains cannot be considered an effective agent in biological warfare, and to my knowledge no method exists to increase their virulence for man.

In conclusion, therefore, I would like to say that in my opinion the use of respiratory viruses as biological warfare weapons, at least at the present time, is very unlikely. These viruses on the whole give rise only to minor illnesses that are more of a nuisance than a threat, and the possible exceptions, the influenza A and B viruses, apparently lose their virulence for man when they are grown in the laboratory. There are a number of other naturally occurring agents - bacteria as well as viruses - that would be much more likely to be selected because they fulfill the primary condition of possessing a high virulence for man and which also have the other characteristics required of an effective biological warfare weapon.

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POTENTIALITIES OF ENTERIC VIRUSES

Of the viruses that may be found in intestinal contents or stools some have merely passed through the alimentary tract without multiplying there. For this connection only those agents will be considered for which the intestinal tract serves as a site of reproduction and a portal of entry. Two main groups then deserve consideration.

A. The Enterovirus Group

Classification — Approximately fifty distinct immunological types of human pathogens are known; in addition a number of strains, most of them as yet not very thoroughly studied, have been recovered from animals. For the time being they are classified in subgroups: polio viruses, Coxsackie A and B, ECHO and REO viruses.

Ecology — Generally considered to be highly species specific. No doubt man is to be regarded as the natural host of the human pathogens. However, during epidemics, virus is invariably found in coprophageous flies; whether the insects serve as true intermediate hosts or only as mechanical carriers is a question that has not yet been definitely settled. Enteroviruses are ubiquitous; the prevalence is high in tropical regions, diminishing as the climate gets colder. Only small isolated communities, principally in the Arctics seem to be free.

Pathogenicity — The majority of naturally occurring strains must be considered as entirely or comparatively harmless, causing no or insignificant symptoms. Even infections with potentially pathogenic strains run a subclinical course in the great majority of cases. Some strains of the Coxsackie B subgroup have been observed on occasions to produce symptoms in about 75% of infected persons; some ECHO viruses, notably the ECHO 9 strains responsible for the 1957 outbreaks, may have caused clinical manifestations at similar rates. Polio viruses have occasionally -- in immunologically virgin, isolated communities -- produced paralytic disease in 10 to 15% of the population. However, the average rate of clinical manifestations may be estimated at approximately 0.1% of infected individuals in the youngest age groups, increasing gradually with age to something like 2 to 5% in the age groups of 25 years or more. Deaths from Coxsackie B myocarditis in infants have been reported. Apart from this, only the polio viruses seem to cause lethal infections. The mortality rate may be estimated at 5 to 6% of the cases of paralytic poliomyelitis. An additional 25% suffer permanent disability. The disease tends to run an increasingly severe course with increasing age of the patient.

Epidemiology — In the present connection two factors of decisive epidemiological importance should be pointed out. (a) As a consequence of the ubiquity of the viruses, immunity is widespread and appears early in life. In tropical regions the population aged more than 5 years seems to be practically 100% immune to all enteroviruses so far studied in this respect. For those temperate zones where the dissemination of these agents is most restricted the immunity level in adults is still 50% or higher. (b) Enteroviruses tend to show the phenomenon of interference -- establishment in the organism of one agent prevents or reduces the probability of successful simultaneous infection with others. These two factors together may account for the fact that epidemics caused by any one particular member of the group, in demographically stable populations occur in waves with peaks 5 to 7 years apart. The extended use of live polio virus vaccines during the last two years has offered opportunities for experimental, epidemiological studies in human populations. The spread of virus from artificially infected children is usually reported to involve 25 to 30% of non-immune contacts. However, certain strains under favorable conditions have been observed to spread like wild fire.

Laboratory Aspects — These viruses are easily grown in bulk in tissue culture. The minimal infectious dose of tissue culture grown, "attenuated," non-pathogenic polio virus is found to be of the order of 10^{-4} ml. of crude tissue culture fluid. The infectivity of pathogenic strains is presumably much higher; an MID of 10^{-9} ml. of fluid or less is probably feasible. These viruses are remarkably stable in solution but lose most of their activity when dried. As Dr. Lwoff told us yesterday, methods have been elaborated by which in the course of tissue culture passages excessive changes in pathogenicity may be regularly and easily achieved. Whether production of mutants by chemical treatment of the isolated nucleic acid is feasible has not yet been established. McBride recently described an antigenic variation within the immunological types of polio virus, previously considered homogeneous in this respect. I have studied this phenomenon during the last few months with particular regard to the genetic stability of the antigenic structure. The strain differences observed are minor, demonstrable only with a very precise technique. The antigenic spectrum is surprisingly wide, however. Derivatives of a particular strain generally conform with the parent virus but occasionally a single passage through the human intestinal tract seems to be sufficient for production of a distinct change in antigenic properties, indicating that the immunologic strain specificity might be as labile a character as pathogenicity and some other so-called genetic markers.

Conclusions — Enteroviruses possess some of the properties required of potential P. W. agents. It is hardly likely, however, that anyone of the strains now available could be successfully employed for such purposes, primarily on account of the widespread immunity. The emergence

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of new antigenic variants in the course of experiments currently being made in several laboratories must be considered as a definite possibility, which would radically change the situation. Enteroviruses are probably best suited for anonymous attacks; delivery by sabotage -- contamination of water and food -- would not seem to present too great problems.

B. Infectious Hepatitis Virus

The properties of this virus are still largely unknown. It has not been established in tissue culture or any extra human host. It is known, however, to be remarkably stable in vitro and, thus, to fulfill one fundamental criterion of those now under consideration.

The epidemiology of hepatitis resembles presumably that of other enteric viruses. It has a global distribution, apparently more widely disseminated in tropical than in temperate climates. It is generally assumed that immunity to hepatitis falls into the same pattern as that characteristic of enteric viruses. However, an outbreak in Sweden a few years ago seems to justify some revision of this assumption. The outbreak in question, comprising several hundreds of cases, could be traced to a few shipments of oysters that had been stored for a few days in the harbor of a small fishing village on the west coast. Each shipment of the suspected oysters could be traced and practically all consumers could be identified and questioned. The analysis of the outbreak was complicated by the fact that some shipments were made up by a mixture of freshly caught and stored oysters which could not be sorted out at the retail and consumer end. The observed attack rates among oyster eaters may therefore not reflect the true infectivity of the contaminated shellfish but come out as too low. Against this background the actually observed clinical attack rate of 75% among consumers of suspected oysters seems remarkably high, particularly in consideration of the fact that almost only adults were involved.

As the virus cannot at present be propagated in the laboratory, the only available source seems to be infective discharges from patients. Apparently large quantities of virus are excreted for comparatively long periods of time; the material can be concentrated and purified by chemical methods, the end product being well suited for BW purposes. Despite the element of chance in the collection of material, hepatitis virus seems to offer certain possibilities as a biological weapon.

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THE POTENTIALITIES OF SMALLPOX AS A BIOLOGICAL WARFARE AGENT AGAINST MAN

Of the numerous self-propagating dermotropic infections of man, the most devastating viral disease is smallpox. It is a disease of world wide distribution, occurring in epidemic and endemic forms in Asia and Africa. In recent years smallpox has virtually disappeared from Europe and North America but every now and then these continents become infected by importation of cases from endemic areas. For all practical purposes, however, these countries can be considered as free from smallpox. Consequently vaccination of infants and young children is no longer practiced as a routine, with the result that the vast majority of the people of these countries have practically no natural or acquired immunity against this disease.

The introduction of smallpox, if it were possible, would, in a virgin soil like Europe and America give rise to serious morbidity and mortality, depending on the nature and virulence of the strain introduced. The problem we are concerned with is whether an aggressor could make use of smallpox (variola major) virus as a weapon of attack in biological warfare. In other words, can variola virus be grown under artificial conditions and remain infective for man?

That is a difficult question to answer. No human trials have ever been undertaken with this particular object in view, nor have we an animal which can take smallpox as such. Although smallpox is a disease of great severity which has been engaging the attention of microbiologists for many years, very little experimental work has been done with variola virus itself. The closely related vaccinia virus has been studied extensively and much of our knowledge of the properties of variola virus has been acquired from work on vaccinia. With this limitation in mind and with the data which are available as a result of variola virus studies, we can say that the virus responsible for smallpox is easy to grow in the laboratory and massive yields of virulent strains can be had in a matter of 72 hours from the chorioallontoic growth of embryonated eggs. The virus remains viable for long periods in the freeze dried state. It is not affected by sulphonamides, penicillin or streptomycin when tested in chick embryos. It can withstand drying for weeks when kept at room temperature. The size of variola virus is of the order of 150 to 200 microμ. This fact is of particular biological significance. Although some of the aggregates of larger size may be retained by the nasopharyngeal barrier, the smaller particles can easily reach the lung alveoli and penetrate the alveolar barrier causing viraemia and systemic infection. Using modern methods of culture, the virus can be easily grown and dispersed in a size which could cause acute respiratory infection. Given suitable metorological conditions, smallpox virus could serve

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as a weapon of great potentiality to the non-immune population of many countries, especially the static population in large cities.

The problem of dissemination of the virus is one of technical development. There is no limit to the variety of specially designed missiles, bombs, shells etc. which discharged from planes or ships could create smog like clouds over cities for several hours and which may diffuse over several miles. The well known work of Dr. Fotherengell affords a pertinent illustration in this connection. Using particles of 1-5 micron size of a bacterial culture (B. globigii) and by employing aerosol spray from the rear deck of a ship, cruising about 2 miles from the shore he could recover the organism at a distance of no less than 23 miles from the source.

The normal route of infection with smallpox is mainly through the respiratory tract and the possibility of aereal dissemination of infection if deliberately attempted cannot be ignored. There is no reason why infective material either in the freeze dried or liquid form could not be used for the purpose.

Smallpox as a warfare agent has certain tactical advantages from the enemy's point of view. The long incubation period of 12 to 14 days would enable the enemy to introduce the infection without being detected. The use of a strain which could provoke only a mild type of disease might again be considered more suitable by the enemy because it would cause less public alarm and consequently less expeditious public health action. Smallpox does not produce the terrible casualties or permanent injuries or so many deaths as chemical or nuclear warfare. Given an efficient and well organized public health service, it is not likely that its spread could not be controlled in a reasonably short time. The immunity of the population could be raised with ease, provided adequate steps are taken in advance to store potent lymph in sufficient quantity at a number of centers. I mention the word potent because it is not known whether ordinary lymph will protect against the kind of disease which would result from the enormous dosage of infection and the enhanced virulence of the strain. The disease may be different from the ordinary smallpox as we know it today.

Prophylactic vaccination of the general population and keeping the vaccination state as near 100 per cent as possible is the answer for defense purposes. Vaccination does not offer absolute immunity. No bacterial or viral vaccine does, but this much is certain that smallpox vaccination exerts a very marked protective action against morbidity and mortality.

The problem which faces us is when to use mass vaccination. For a prophylactic agent of such undoubted value it would appear reasonable to encourage its extensive use and revaccination every 3 - 5 years. The hazards of smallpox vaccination, namely generalized vaccinia and post-vaccinal

encephalitis are of the order of 23 per million and 1.2 per million respectively. Against this must be weighed the chances of infection, nearly 100 per cent in unvaccinated individuals and the 20 - 25 per cent mortality associated with this disease. In India during non-epidemic times about 60,000 cases are notified annually. In epidemic years anything up to four times this figure is not unusual. This being the case in a country, where smallpox is endemic, where the people have developed a certain degree of natural immunity and where vaccination is encouraged and considered more or less compulsory, one can imagine the havoc it could cause in a non-immune population of the West.

Nuclear warfare today is in a state of suspended animation. The risk of world wide radioactivity and radiation sickness has produced a condition of stalemate. The chances of biological and chemical warfare are correspondingly increased. To deter an aggressor from the use of such weapons the free world must stimulate and strengthen research in this field. It is by a gradual permeation through our peoples of the knowledge of risks which imperil the world today in the fields of bacterial, chemical and nuclear warfare and by carrying out intensive research to meet the challenge, that we shall eventually feel our way to a remedy for our social and political troubles. Recent introduction by man of myxomatosis amongst rabbits has shown that something like 90 per cent of the population can be decimated by virulent strains. This just shows that the science of bacteriology which has freed the world from many types of plagues and pestilence can create more lethal plagues than nature ever did. Man-made and uncontrollable epidemics are not myths. As long as war is possible, the use of bacterial agents as weapons of attack is possible. A plea is put forward for intensive immunological study particularly in regard to protective agents against biological weapons.

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A. A. Smorodintsev (Soviet Union)
August 26, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare. V.5

The Potentialities of Arthropod-Borne Viruses as a Biological Warfare Agent Against Man

The group of viruses transmitted to man through bloodsucking vectors is the largest one, and has grown very fast during the last few years. Five years ago this group included nearly 60 species; one year ago, 82 (during the Lisbon Congress); and now more than 100 different viruses. Many of these new viruses were isolated only from mosquitoes in Africa and South America, and their role in inciting distinct human diseases is not clear or not very probable in natural conditions.

Among human arthropod-borne diseases with a well-known etiology, especially important are yellow fever, dengue (with now four different serological types), phlebotomus (papatasii) fever, and especially many varieties of viral encephalitis transmitted through mosquitoes such as the Japanese, Saint Louis, East and West equine encephalitis in USA, Venezuelen, West Nile and many other forms.

A very important group of diseases transmitted through ticks is represented by tick-borne encephalitis and includes Russian Spring Summer Encephalitis (paralytic and biphasic meningeal variants), Louping ill of Sheep in Scotland and North England, as well as clinically quite different Omsk-type haemorrhagic fever in the USSR, and the much severer Kyasanur Forest disease in India, studied recently by a group of American and Canadian virologists in Poona.

The most important characteristic of all arthropod-borne disease is its strong peculiar ecologic distribution closely linked with very specific geographical and climatic conditions where disease vectors exist and the reproduction and spread of viruses through a natural cycle of mammals or birds is possible. That is the reason why the group of arthropod-borne diseases is much larger in tropical or subtropical regions than in countries with a moderate climate.

Most arborviruses are highly pathogenic for white mice and for the lower monkeys like Mac. rhesus, especially through intracerebral or intranasal route of inoculation. In the last case, the spread of virus in the organism of susceptible species occurs via the olfactory route, but does not develop directly in the respiratory tract, which explains the absence of contact infection between i/nasally infected animals. For the most part these viruses multiply very intensively in developing chick eggs (allantoic cavity and brain of chick embryo), and also on primary or continuous tissue cultures usually without cytopathogenic changes in susceptible cells.

These viruses lend themselves to being mass produced, without technical complications, for different purposes (with the exception of preparation of vaccines) on simple cultivated malignant cell cultures like Hela cells adapted to horse serum. All viruses of this group are sufficiently resistant to prolonged storage in cold temperatures of from 0 - 4°.

The genetic properties of this group of viruses are exceptionally stable, including neurovirulence for mice, monkeys and men even during very long artificial passages through new species of animals, chick embryo, or tissue cultures. This is especially true for agents of the encephalitis group, like tick-borne encephalitis virus, considering the striking stability of its virulence for monkeys and men even throughout more than 20 years of passage under different laboratory conditions. All attempts to obtain attenuated strains from this or Japanese virus were completely unsuccessful up to the present time.

Virological as well as serological diagnostics are well studied, but a great multiplicity of etiological agents complicates very much the chances of rapid identification of new exotic types of these viruses isolated from patients. Considering the potentialities of these agents as biological weapons, it is possible to estimate a possibly very high danger potential of this group for the following reasons:

1. Among arthropod-borne viruses there exist many species which under natural conditions of infection incite high lethality in human beings up to 30% and more. Yellow fever, Japanese encephalitis, East equine encephalitis, belong to this group of viruses. Considerable rate of loss is also incited by the paralytic form of tick-borne encephalitis, Kyasanur Forest Disease, new types of Dengue virus described by Hammon.

2. The same agents are highly pathogenic for human beings when a condition of artificial respiratory infection obtains, and play a most important role also in occasional laboratory infection. These cases have demonstrated to us that artificially-induced respiratory infection is much more dangerous than natural transmission through the ticks.

3. Agents of this group, in counter distinction to natural respiratory viruses, with exceptions of psittacosis forms, possess remarkable stability with respect to their genetic properties, in the first place, high virulence for man which may be tested sufficiently correctly by experiments on monkeys. We can consider very real the possibility of increasing its respiratory activity and also of its neurovirulence by using special methods of selection analogous to Dr. Lwoff's information on possibilities of these tasks by adaptation of neurovirulent strains to reproduction in high temperatures.

4. A great variety of pathogenic species with completely different antigenic structures stress the potential importance of this group with respect to its tactical use in the field, and to the possibility of selecting various agents, thereby blocking to a large degree the use of counter measures.

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5. In counter distinction to natural respiratory viruses in the case where an attack of insufficient dose is carried out, or where bio-materials do not completely reach the enemy, an immunization of the enemy does not follow, but only an absence of infection for the reason that its reproduction cannot be accomplished without contact with the highly susceptible central nervous system. Incidentally, mass application to humans might produce a special condition, namely, the formation of new respiratory variants, able to multiply in the respiratory tract.

6. This group of viruses is suitable for large-scale mass reproduction under artificial conditions in tissue cultures with concentrations up to 6-7 lg. of 10 in 1 ml. in association with potential malignant factors of tissue culture.

7. Artificial introduction of these viruses may be followed by the formation of natural foci in regions where existent vectors are not infected with particular agents.

8. On the list of likeliest candidates we may include the following viruses: yellow fever virus (in original human pathogenic form), viruses of Japanese, equine encephalitis, tick-borne encephalitis agents (paralytic and haemorrhagic forms).

Margaret Mead (Spain)
August 26, 1959
Pugwash Conference of International Scientists on Biological and Chemical Warfare V.6

CABLEGRAM

BARCELONA, SPAIN
AUGUST 25, 1959

BROCK CHISHOLM
PUGWASH, NOVA SCOTIA

MISSING YOU HERE. COUNTED ON DISCUSSING WITH YOU THE DANGER THAT PUBLICIZING BIOLOGICAL WARFARE WITH NO POSSIBILITY FOR USING INTERNATIONAL ORGANIZATION AS A DEFENSE MAY LEAD TO NIHILISTIC ACCEPTANCE OF ATOMIC CATASTROPHE OR ESCAPIST APATHY. NUCLEAR THREAT BECAUSE OF SCALE AND TANGIBILITY PROVIDES BETTER FOCUS FOR CITIZEN ACTIVITY. PLEASE CONSIDER THIS.

MARGARET MEAD

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M. G. F. Stoker (Great Britain)
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Pugwash Conference of International Scientists
On Biological and Chemical Warfare

THE POTENTIALITIES OF THE RICKETTSIAE IN BIOLOGICAL WARFARE

Epidemic typhus is supposed to have affected the outcome of many wars during the last 500 years in Europe, and no doubt victorious generals may have assumed a divine microbiologist to be on the right side. The possible use of pathogenic rickettsiae by less divine microbiologists will be considered in these notes.

The rickettsiae are primarily parasites of arthropods, and in particular, ectoparasites - ticks, mites, fleas and lice. Those rickettsiae which are known to cause disease when transmitted to humans are as follow:

Rickettsia prowazeki	(epidemic typhus)
Rickettsia mooseri	(murine typhus)
Rickettsia akari	(rickettsial pox)
Rickettsia rickettsii	(spotted fever group)
Rickettsia tsutsugamushi	(scrub typhus)
Rickettsia quintana	(trench fever)
Coxiella burnetii	(Q fever)
Rickettsia pavlovski	(infectious nephronephritis)

In addition, Rickettsia ruminantium is the cause of "heartwater," a disease of sheep, goats and cattle in South Africa.

The rickettsiae which have been adequately studied contain both DNA and RNA, as well as numerous enzymes, and divide by binary fission. It is not known if division is necessarily intracellular. Accurate assay methods have not been available, and precise genetical studies have not been reported.

The following notes cover certain general properties of the rickettsiae which relate to their possible use as weapons, and concern immediately practical considerations rather than more distant speculation. With few exceptions, such as Coxiella burnetii, the different species are not considered separately.

1. Virulence. The untreated rickettsial diseases of humans vary greatly in severity, even in different outbreaks of the same disease. The mortality rate of Rocky Mountain Spotted Fever and some outbreaks of scrub typhus may be 20%, whereas deaths from Q fever and trench fever are rare. The severity of all these diseases, however, is greater with increasing age.

2. Chemotherapy. All the known rickettsial diseases can be treated effectively by the rickettsiostatic drugs - chloramphenicol, chlortetracycline, and oxytetracycline. These drugs can also be used prophylactically. No drug-resistant strains of rickettsiae have been reported.

3. Vaccination. Effective vaccines are available against naturally occurring strains of most of the pathogenic rickettsiae. Given a sufficiently large poultry industry, such vaccines are not technically difficult to prepare in eggs or tissue culture, but could not be produced at short notice against new antigenic types. No stable antigenic variants of rickettsiae have been reported so far, however, amongst naturally isolated strains, or in the course of laboratory experiments.

4. Production. Mass cultivation of pathogenic rickettsiae in eggs or tissue culture is relatively simple. All the rickettsiae except Coxiella burnetii, however, are very sensitive to normal conditions of temperature and humidity, so that storage and delivery would be difficult unless more stable variants were found. Attempts to grow the pathogenic rickettsiae in cell free medium have apparently been unsuccessful so far.

5. Transmission. An over-riding feature of all pathogenic rickettsiae, except C. burnetii, is the dependence on ectoparasite vectors for transmission. Epidemics (or epizootics) could therefore be initiated deliberately only if suitable intermediate hosts were present, or were introduced, or if a rickettsial variant was selected which was able to spread directly between humans or animals of economic importance.

The natural arthropod vectors, such as ticks and mites, are probably quite unsuitable for laboratory propagation on a large scale, and their infrequent blood feeds make them inefficient agents of dissemination. The human louse may be more efficient in the spread of epidemic typhus, but even if delivery of any of these vectors was possible on a large enough scale, they would be easy to control in a human population by a moderately efficient government. Some human lice have been found partially resistant to D.D.T. and gammexane, but the old-fashioned methods of control could still be effective. It is only under conditions of national collapse and social disintegration that large epidemics might develop.

If a highly pathogenic variant of, for example, R. rickettsii, could be adapted to and transmitted by an entirely new and widespread vector, such as a common species of mosquito, defensive control measures would, of course, be more difficult. There is at present no indication that this adaptation is possible.

6. Direct spread. A more serious threat might come from the isolation of strains which were able to spread directly between humans, and one must presume the unscrupulous experimental use of human subjects for selection and assay of such strains. In the past, laboratory outbreaks have indicated that infection is possible by the respiratory tract, but normally there is little excretion of rickettsiae from patients, and the organisms are quickly inactivated under ordinary environmental conditions of temperature and humidity. There have been occasional reports of direct inter-human spread of C. burnetii (see below), but no continuing epidemic spread has followed so far.

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7. Q fever. Q fever differs from other rickettsial diseases because it is not normally contracted from ectoparasites. Infection occurs by inhalation or ingestion of C. burnetii from cows, sheep or goats, which shed the rickettsiae in large numbers in the products of parturition (10^{12} hamster I.Ds., 50 per gram, have been reported in the sheep placenta). This mode of transmission is partly due to the unique stability of C. burnetii to heat, drying and chemical disinfectants. This stability may also explain the high incidence of infection in laboratories, and more distantly connected institutions such as laundries serving laboratories, or laboratory workers' lodgings. It also makes C. burnetti somewhat more suitable for deliberate dissemination than other rickettsiae available at present.

Direct infection of humans has occasionally occurred at postmortem examination of patients who died of Q fever, or, on one occasion, when 38 contacts were infected from a living patient with unusually copious sputum. No strains have emerged naturally which can continue to spread directly between humans, so that outbreaks are self limiting, and its introduction as a weapon, at least with current strains, would not give rise to an epidemic.

8. Limited outbreaks of Q fever. The frequency of laboratory infection, and the high attack rate in certain outbreaks, suggests that C. burnetii might conceivably be used tactically or, more effectively, as a weapon of the saboteur. A limited population might be infected by dissemination of an infected dust, or even through food or drink. Admittedly, attack rates have varied greatly in past outbreaks, and for a predictable result, experimental studies on humans would be needed to determine dosage.

A situation which might lend itself to this would be an impending coup d'etat in a small country. If a suspension of C. burnetii could be introduced three weeks previously into the air-conditioning system of an important building, such as a broadcasting station, or key government office, it might send a large number of the staff to bed at a critical time. In such a situation, the low fatality rate and the absence of uncontrolled secondary spread might turn out to be advantages not pertaining to other microorganisms. Moreover, explosive outbreaks of Q fever occur naturally, and the incident might even be passed off retrospectively as a lucky coincidence.

9. Conclusion. In conclusion, and save for startling (and unpublished) observations, of which the author is unaware, the pathogenic rickettsiae do not at present seem suitable as weapons of war, by either large or small countries, except, possibly, for the very limited use of C. burnetii, as indicated, in acts of sabotage.

A. A. Imshenetsky (Soviet Union)
August 26, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare VI. 2

MODERN MICROBIOLOGY AND THE BIOLOGICAL WARFARE MENACE

Mr. Chairman, ladies and gentlemen. May I express my profound gratitude to the organizing committee of this conference for the opportunity to present this report.

The middle of the 20th Century has been marked by an exceedingly swift development of natural science, and especially of physics and chemistry. The pace of development in a number of sciences is so rapid that we have every right to say that the number of scientific discoveries is growing geometrically. Unfortunately, some of these scientific discoveries are being used not only for peaceful purposes, but have been used as the foundation for the development of new and exceedingly lethal types of weapons. These include atomic energy, the chemical poisonous substances and the employment if micro-organisms in biological warfare.

Only scientists working in the fields of physics, chemistry, biology or medicine, can have a clear and strictly scientific idea of the capabilities of each of these weapons. Only scientists can foresee the disastrous implications of the employment of these weapons and determine the tremendous harm that they could bring to mankind. This makes clear why it is precisely the scientists of the world who were among the first to oppose the employment of atomic weapons.

A number of prominent scientists and outstanding public figures, suffice it to mention Lord Bertrand Russell, Cyrus Eaton and Powell, are taking the most active part in the Pugwash Conferences, which have urged the discontinuation of the arms race, the establishment of international cooperation, and the increase of the responsibilityof scientists in the struggle for peace. At this conference we shall discuss the problems related to the possible employment of microorganisms as a weapon. May I, as an expert in general microbiology, present my views on this subject.

Microbiology is a comparatively young science, but it is hard to find another scientific subject where international scientific cooperation was implemented so successfully. The medical microbiologists of various countries are developing the immortal ideas of Pasteur, Mechnikov, Koch, and are successfully combatting various infectious diseases in man. The successes in the field of social hygiene, the production of vaccines, serums and new drugs, the elaboration of new laboratory methods of diagnosis - are all due to vigorous research of scientists in many countries of the world. Thanks to their effort many infectious diseases which formerly were taking up to thousands of human lives are now totally or almost totally eliminated. Examples are smallpox, plague, cholera,

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and typhus. The incidence of hydrophobia and syphilis has decreased radically, while malaria has been almost entirely eliminated in several countries. An example of a successful solution to a common problem is the research in poliomyelitis which has enabled the American Professor Salk, the Frenchman Lepine, as well as Soviet scientists to suggest effective vaccines against poliomyelitis. Humane objectives, common tasks and faith in ultimate victory over all contageous diseases unite international scientists and lend their efforts an international nature.

During the past 20 or 30 years, microorganisms have been widely employed for obtaining a number of physiologically active substances: antibiotics, hormones, enzymes, and vitamins, and also for producing fodder yeast, etc. As a result, new branches of microbiological industry have developed, the products of which are necessary for the treatment of patients or for different branches of national economy. In this sphere too, close contact has been established among microbiologists of different countries, and the successes which have been achieved have come as a result of joint effort of many scientists.

All the work of microbiologists along the above-mentioned lines is devoted to constructive microbiology, to the microbiology of peace and progress, illuminated by the ideals of fighters for the life and health of mankind.

Unfortunately, at this Conference we are concerned with another sort of microbiology - microbiology which brings death and destruction; microbiology, the goal of which is wholesale annihilation of people. In our day the term "biological warfare" covers not only bacteriological warfare. Not only bacteria may be used as a means for attack, but primitive organisms as well - rickettsae and viruses. Also possible is the employment of toxins formed by microbes and possessing an exceedingly high degree of toxicity, but this is, in a way, a subject apart, since the toxins are not reproductive in the organism of man, and in this case it is more correct to speak not of contamination but of poisoning the organism by toxins. From this point of view there is no basic difference between the employment of toxins and of the chemical poisonous substances.

Biological warfare as a means of mass annihilation could bring great horror to mankind. Its use is not consistent with humane considerations and the rules of international law. Scientists of the whole world must work to put down the threat of a new world war in which means of mass annihilation such as atomic, chemical and biological weapons would be used.

In discussing the possibility of biological warfare and its dangers, it is necessary to dwell on some purely scientific questions which are very important in their practical aspect.

1. Biological weapons may be of strategic importance only if they are prepared and stock-piled in very large quantities.

Many years of study in the physiology of nutrition of pathogenic microbes and the elucidation of their requirements of nitrogen, carbon, microelements, vitamins, etc., have enabled scientists to evolve nutritive mediums in which pathogenic microorganisms reproduce rapidly without losing their virulence. The development of a microbiological industry in all countries had resulted in a thorough study of the conditions for the development of microbial cells in fermenters of 50 cubic metre capacity and higher. Thus, modern engineering in microbiology commands methods which enable it to accumulate tons of cells of pathogenic microbes. The culture of pathogenic viruses is more complicated, particularly in big quantities, but in this case the employment of birds' eggs and of tissue culture have solved the problem. All that has been accomplished as a result of scientific advances in creating a method to mass-multiply bacteria and viruses renders bacteriological warfare more and more dangerous for mankind.

2. The functional peculiarities of a microbial cell are not always stable under conditions of storage. In this connection, the question of methods for the conservation of microbial bodies arises. Theoretical research in this field has shown that when some method of conservation is used, some of the microbes preserve their virulency and others lose it. However, by combining various methods of conservation of cells of microorganisms (lyophilization, low temperature, etc.) it is possible to preserve the material for long periods of time without inactivation. It is natural that this problem is practically irrelevant to those species of bacteria which form spores, since the latter are very stable under storage conditions.

3. Many years ago Louis Pasteur proved that it is possible to increase or diminish the virulence of microbe-agents of diseases in man by experimental means. These opportunities have increased rapidly since then. Modern genetics of microorganisms possesses facts which prove that the virulence and the pathogenicity of microbes may be greatly increased in laboratory conditions. The selection of particularly dangerous strains of bacteria is quite feasible, and one can hardly exaggerate the disastrous implications of this possibility. A number of questions arise in this connection. What will be the course of infection in man contaminated by experimentally-obtained strains? Wouldn't "lightning" forms of diseases originate in this case? Would the preventive innoculation against this type of agent be effective? It is impossible to disregard these probabilities.

4. Ordinarily, to combat pathogenic microbes in the air or on the surface of objects, the aerosols of different disinfecting chemical substances or their solutions are used. The concentrations of various disinfectants, the terms of action, the temperature and humidity, etc., necessary for complete or partial elimination of the microbial cells, are a matter of common knowledge. However, the successes in the field of studying the adaptation of microbes to different physical or chemical factors, proved that any microbe may be adapted to any poison or disinfectant. The microbes get adapted comparatively easily to mercury bichloride, formaline, alcohol, sulphurous anhydride and, with somewhat greater difficulty, to phenol.

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It is theoretically possible to obtain pathogenic forms stable against the majority of known disinfectants. This may be obtained not only by the gradual adaptation of the microbe to growing concentrations of a chemical substance. It has been revealed during the past few years that this stability may be very rapidly produced in an unstable strain with the help of desoxiribonucleinic acid, isolated from the cells of a culture adapted to the given chemical substance. In this way resistance to several substances may at once be acquired. These facts tend to pose the following questions.

Will the disinfecting substances used for the decontamination of these adapted strains be effective? Is it not possible that these cultures would be dangerous also for the population of a nation, which might have employed this type of weapons?

We shall restrict ourselves to examples of how modern microbiology, called upon to combat human diseases, can facilitate the rendering of bacteriological weapons more horrible, inhuman and uncounteractable. They produce no explosions and have no radioactivity; forthermore, unlike all known types of weapons, their harmful action in biological warfare is not restricted to a specific zone as for one blasted by an atomic bomb or by a shell carrying poisonous substances. Pathogenic microbes are capable of spreading rapidly, passing from a sick to a healthy person, and thus covering substantial areas and causing large-scale epidemics.

This ability for independent spread is connected to the specific peculiarities of bacteriological weapons. This is why no scientist can guarantee that the microbes employed as a means of attack would affect only the enemy. The microbes do not recognize national frontiers. This is reflected in the history of epidemiology and the description of serious epidemics. Hence, biological weapons may be quite rightly called a boomerang, since an epidemic may easily spread to the country which has used these weapons. In biological warfare, not only the differences between front and rear are eradicated, but there are a number of causes leading to mass epidemics among the civilian population itself, involving women, children and old people. All this has laid the groundwork for different international organizations to arrive at a conclusion on the necessity of a complete ban on biological weapons.

Scientists and microbiologists working in countries throughout the world should combat the preparations for biological warfare, which will bring mankind suffering, disease and annihilation. No one is as aware of all the implications of the employment of bacteriological weapons as the microbiologists, and this is why they bear the greatest responsibility. The microbiologists of the world are united by an honorable task: that of achieving ultimate victory over infectious diseases.

International cooperation will necessarily help to achieve this victory at an early date. The minds, talents and the experience of scientists working in this

field should not be employed for the elaboration of methods for the use of pathogenic microbes as a weapon of wholesale annihilation. We are well aware that the application of bacterial weapons as early as 1928 was censured by world opinion since in that year 42 ratified the Geneva Protocol, prohibiting these forms of weapons. We scientists must urge all nations, whether or not they are members of the United Nations, to sign and ratify the Geneva Protocol.

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Professor Donald Kerr (Canada)
Professor Preben von Magnus (Denmark)
Professor Gordon Manley (United Kingdom)
Sir Robert Watson-Watt (Canada)
Pugwash Conference of International Scientists
on Biological and Chemical Warfare

METEOROLOGY AND THE PROBLEMS OF DELIVERY

PREAMBLE: This is a somewhat hurried summary prepared at short notice; but we believe that the general principles it contains are acceptable.

We assume that the modes of delivery of the active agents, chemical or biological, in the offensive operations with which this Conference is concerned, will vary widely. The preferred mode will depend on a complex of requirements and conditions which we can envisage only very superficially.

The potential targets of attack (if the world is not guided to avoidance of such conflicts as might invite the use of chemical, biological and radiological agents) will include, on the one hand, crucially important indoor point targets and on the other, large area targets in cities and in relatively open country.

It would be foolish to underestimate the range of ingenuity, artifice, versatility and daring which can be expected of the gifted saboteur. He must be envisaged as ranging from the study of the key enemy leader, through areas of the size of several city blocks, to the channels of city water supply. We are, happily, not called upon to evaluate his problems or his potential; although, as an individual, he would still be dependent upon the local meteorological conditions.

When, however, we turn to the aircraft, the guided missile, the ballistic missile, the free balloon and the aerosol or other quasi-free suspension, meteorological considerations become very important. It may, indeed, be no exaggeration to say that the success of "CBR" operations is likely to depend on the continued existence of a world meteorological observing and reporting network, and consequently on the enjoyment of world-wide radio communications despite the electronic counter-measure war which will be waged against them.

The manned aircraft as a distributor of CBR agents is itself peculiarly vulnerable to electronic counter-measures, since the weather conditions favoring the effective distribution of these agents are those which are often characterized by poor visibility and a low stratus cloud cover, compelling dependence on non-visual target-finding.

Weather conditions at the target are likely (so far as present knowledge goes) to be decisive for the success or failure in effective delivery of the chemical biological agents. At the one extreme, a moderate degree of turbulence will suffice to produce a rate of dispersal preventing the delivery of x milligrams per

unit of volume, whatever x may be. These prohibitive conditions occur within the coverage of a normal depression, with its complex of fronts and squall lines, and the like, subject, indeed, to temporary lulls, but lulls whose mildness, time of occurrence, duration and position are virtually unforecastable, especially from a distance.

At the other extreme, "ideal" conditions for effective delivery are to be found in the surface and low level inversion of temperature lapse-rate, especially in a narrow valley, under a stagnant anticyclone, particularly near the margin of the anticyclone. In the early morning, a tight delivery of the agent can be effected, to be relatively smoothly distributed by the convective currents which rise in the half hour or so immediately following sunrise. Since this type of meteorological situation is relatively stable, and may well persist for several days, the meteorologist, in whom should be vested the authority of decision, has a comparatively easy task. It must not, however, be forgotten that the meteorologist at the receiving end has also an easy task in warning his protégés of the imminence of the risk of attack.

The homogeneity of the rising current supporting the agents slowly falling through it must not, however, be overestimated. The thermal properties of the varied ground features of the area under attack will produce a changing mosaic of rising currents of different velocity and different cross sections. The majority of these rising currents may generally be assumed to die out at a height of the order of half a kilometer above ground. Even within a large city appreciable local variations in density of atmospheric pollution quickly develop.

Associated with these same favorable meteorological conditions over target, there will frequently be en route conditions, presenting substantially greater difficulties to the forecaster, when the launching and target areas are widely separated. These difficulties will be common to the meteorologists at both ends of the trajectory, and common, though in different degrees of importance, to all the aerial vehicles indicated above.

In the circumstances outlined above, a wider distribution of the agent, within the same meteorological conditions, can be achieved by an air-burst at some half to one-and-a-half kilometers above ground.

The ultimate area of coverage in such operations may, in not infrequently occurring conditions, become very large indeed. Pollen drifts over distances of several thousands of miles are familiar in the literature; the "blue sun" phenomenon observed some years ago in the United Kingdom was due to smoke particles, at some 30,000 ft. altitude, which had travelled from Canadian forest fires. Volcanic ash and high-altitude dust hazes can also be mentioned; they may occasionally travel round the earth, even smoke pollution may be perceptible 200 miles from the source.

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It should, then, be recognized that an air-burst may, albeit in comparatively rare circumstances, have a global distribution such that part of its burden may be deposited at the launching site, from "fore or aft" -- although biologically active agents will almost certainly have lost their potency either through normal life-span or through insolation.

In the summer season, the vigour of local convection en route and over target will almost always be prohibitively effective, save on the outer fringes of a stagnant anticyclone and for short periods about sunrise. These regions can be recognized by the meteorologists of both sides, if the world weather reporting network has survived in its full effectiveness. The light winds occurring in this fringe area may be specially favorable to wide distribution.

The warmer months are, save in very special cases, unsuitable for the modes of distribution under discussion here, because of the development of more or less vigorous turbulence early in the day and continuing throughout the day. The early months of the fall season are, on the other hand, likely to be specially favorable to effective distribution.

Falling rain is generally quite intractable as a carrier, for the double reason that it gives poor distribution and that it is unfavorable to inhalation in effective doses, by mere dilution to innocuous concentrations. It will already be clear that strong sunshine is likely to destroy the biological agents.

It is not useful to attempt precise forecasts for the target area in operations over distances of some 500 miles or more in an East-West direction; the North-South directions are, somewhat less difficult, but still unpromising. Indeed, formidable difficulties attend the problem of forecasting by a hostile meteorological organization with sufficient precision to ensure satisfactory dissemination of the noxious substance at the target area.

It should be re-emphasized that a defensive situation of relative strength can be established through good local meteorological services, coupled with good vehicle detection and location networks.

Quantitative estimates of probable point of impact, or of density of delivery, cannot in the present state of our knowledge, usefully be attempted, even in the simplest case of pollen-like solids.

It may usefully be repeated that an immediate pre-dawn and just post-dawn period of some thirty minutes' duration is likely to be regarded as the main danger period. We reiterate that the establishment of a skilled and alert weather forecasting service in the target area would greatly strengthen the defensive system against surprise CBW attack.

Suitable meteorological conditions are by no means confined to the great river basins with their important cities in temperate lands. A representative "ideal" target - meteorologically and not politically! - is a narrow strip of the west coast of Peru, North Chile or California, in summer. There a relatively narrow strip of stratus would normally give additional protection to bacillus or virus against destruction by insolation.

We recommend to interested parties that they should consider the Aleutians, Iceland, the Falkland Islands, or the outer Hebrides as promising "houses of refuge"!

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Lord Beaverbrook (United Kingdom)
August 26, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare VII. 2

CABLEGRAM

LONDON, ENGLAND
AUGUST 26, 1959

CYRUS EATON
THINKERS' LODGE
PUGWASH, NOVA SCOTIA

I HAVE NEVER WAVERED IN MY BELIEF THAT THE DIFFICULTIES BETWEEN THE WEST AND RUSSIA CAN BE REMOVED BY CLOSE AND RESOLUTE DISCUSSION BETWEEN THE MEN IN POWER. NOW IT SEEMS YOU MAY BE VINDICATED IN YOUR LONG STRUGGLE.

LORD BEAVERBROOK

F. C. Bawden (Great Britain)
August 28, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare IX. 1

PLANT DISEASES

The losses of agricultural products from the depredations of different pests and diseases vary greatly from year to year and place to place, but their total over the whole world is each year enormous. It may seem paradoxical for me to say that I find some comfort from this statement, but I do for two reasons. First, despite these losses, the human race does manage now to get enough food, not only to survive but also to increase at an almost frightening speed. On the optimistic assumption that the race will not annihilate itself in a nuclear war, producing enough food in the future is going to be the world's major problem, and it is reassuring to know that, when we learn how to prevent current losses and apply the knowledge, there will be enough produced from land currently cultivated to feed at least twice the present human population.

These remarks may seem irrelevant, but I shall not apologize for starting my contribution with them because they show that I am accustomed to thinking of pests and diseases in the context of preventing losses, rather than in the context of today's discussion. The use of pathogens in war to increase losses and so starve an enemy into submission is a subject I do not contemplate readily, so I am glad to say it is in this new context that I find my second reason for comfort from the present position. What we have learnt from studying the behaviour of pathogens while trying to decrease losses leads me to conclude that attempts to destroy crops by deliberately introducing pests and diseases into enemy countries are unlikely to provide practical methods of waging war.

Much of the history of plant pathology may appear to conflict with this conclusion, so I obviously need to justify it; to do this I shall have to consider some of the factors that control the spread of pests and diseases in crops, and to compare what might be done by increasing their depredations with what might be done by other methods of waging war. What may seem most obviously to conflict with my conclusion are the many examples of pests and diseases that have led to past famines or have made it impossible to grow a given plant where it previously flourished. Here I need list no more than the well-known Irish famine that followed the outbreaks of potato blight (Phytophthora infestans) in the 1840's, the failure of coffee growing in Ceylon because of rust (Hemileia vastatrix) and the elimination of the American chestnut (Castanea dentata) by blight (Endothia parasitica). These events are all thought to have followed the introduction of a pathogen into new territory, and they could be taken as illustrating how easy it would be to embarrass an enemy by introducing an appropriate new pest or disease into his country.

When examined more closely, however, the idea becomes less attractive and the difficulties more apparent. Of the three examples I have quoted, only the first

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could possibly have affected the course of a war. Not only could countries survive without coffee or chestnut trees, but Endothia parasitica took many years to eliminate the chestnut forests of the USA, a short period in the life of forests but too long to win a war. Similarly, although swollen shoot of cacao, another disease that has received much publicity because of its economic effects in West Africa, has killed many millions of trees, it has taken perhaps 50 years to do it, and even when spreading most rapidly was probably never killing cacao trees as fast as new ones could be brought into bearing.

To be effective in war, any introduced pathogen must devastate a major food crop and must spread very rapidly. Potato blight amply fulfilled these requirements when it reached Ireland during the 1840's. Ireland was dangerously dependent on the potato, and Phytophthora infestans is an unusual fungus, because it not only decreases yield by killing the leaves, but also rots the part of the plant that is stored and eaten, and in favorable weather it produces spores at prodigious rates and can complete a cycle from infection to sporing in a few days.

The weather in Ireland and many other countries still often favors the disease, but other conditions are different today, and there is little chance that potato blight will again have such terrible consequences. No country now depends so much on the potato and, where the weather makes blight a frequent trouble, the crop is already regularly sprayed with fungicides. Indeed, it is doubtful whether there is now any country in which the potato is a major food crop where introducing the fungus deliberately would affect the incidence of the disease. P. infestans has already been so widely distributed that whether potato blight is now important in any country depends not on the fungus being there, but on the weather allowing it to multiply and spread extensively. Hence, there seem only two ways in which potato blight could be made increasingly troublesome, and each would entail difficult genetical work; one would be to breed forms of the fungus that resist current fungicides, and the second to breed forms that multiply and spread in weather quite different from what current forms of the fungus require.

In countries largely inhabited by rice-eaters, I suppose the introduction of a pathogen behaving towards rice as P. infestans can towards the potato might quickly cause a famine, but I know of no such pathogen. I suppose one might be bred, though I rather doubt it. I do not propose here to consider the possibilities and problems of producing new plant pathogens, variants that would be more virulent, have a wider host range or be less affected by changes in weather than are current ones, because these possibilities and problems are common to all pathogens and will be dealt with in other sessions of our meetings. I acknowledge the possibilities, but am not very impressed by them because I think experimental breeding of pathogens is unlikely to achieve much more than undoing the good the plant breeders do in producing disease-resistant varieties. For instance, I think it will be relatively easy to get strains of pathogens to infect all varieties of a plant of which now only some varieties are susceptible, but it will be difficult to alter a pathogen so drastically that it will attack a wide range of new species or be able to spread in an entirely new set of environmental conditions.

Not all pests and diseases are quite as restricted by weather as is potato blight, but all are affected to some extent and each increases rapidly only within a limited range of conditions. This fact shows in the annual variations in yields of crops, many of which are caused by weather acting indirectly on the crops by affecting the incidence of different pests and diseases. This dependence is greater with air-borne than with soil-borne pathogens, but it is only air-borne pathogens that I think would spread quickly enought to affect the course of a war.

Many soil-borne pathogens are immensely destructive, and some can render land quite unsuitable for growing a given crop for many years; examples of these are the potato wart disease fungus and potato root eel-worm, the clubroot fungus of crucifers, and the fungus that causes Panama disease of the banana. However, most such pathogens have only limited host ranges and, although they prohibit the growing of some crops, others can be grown on the infested land. Agriculture would obviously be impossible if such virulent pathogens had unlimited host ranges, but the fact that they can infect only a few species of plants needs stressing here, because this is what strictly limits their use as weapons in war. The economy of a country might well be affected permanently by introducing into it soil-inhabiting pathogens of this kind, but it is unlikely they could be introduced in sufficient quantities to produce results rapidly. The diseases could no doubt be initiated without too much difficulty, but they would spread only slowly; several successive susceptible crops would have to be grown before the diseases could become prevalent and serious enough to cause large losses, so their effects could only influence the outcome of a protracted war of attrition.

Whether or not a country now has an important air-borne pest or disease of a major plant food crop depends, I think, largely on whether the climate there favors it, for the world-wide traffic in plants and the increase in volume and speed of travel of recent years make it unlikely that any large area has escaped contamination at some time or other.

I do not wish to suggest that we have reached the climax with air-borne pathogens and that there are no more troublesome ones to be discovered; this suggestion would be quite unwarranted, for there will certainly be many outbreaks of new diseases that will cause great losses in the future. Some of the pathogens responsible for such future troubles no doubt already exist somewhere as trivial pathogens of major or minor crops, and will prove troublesome when they spread to other regions, either because they will meet there a new lot of hosts more susceptible than their present ones, or because they will meet conditions that better favor their spread.

An example of the kind of thing that is likely to happen is provided by the outbreak of Maize (corn) rust (Puccinia polysora) in Africa during recent years. The causal fungus has been known in America for a long time, but has never been important there, whereas when it reached West Africa it was so devastating that it immediately turned some countries from maize-exporters to maize-importers.

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This is, of course, the kind of effect that could help to win a war, but I think would not have been achieved deliberately because no one could have predicted the results of introducing this fungus into Africa. Hind-sight makes the possibilities only too obvious, but they could not have been foreseen, at the best only guessed at. Also, even in West Africa, the fungus has not been devastating each year since it appeared there, for again it seems to depend on the weather, and this dependence will always make the outcome of any attack with crop pathogens very uncertain.

There are almost certainly many serious soil-borne pathogens of major crops that have as yet spread, or been spread, less widely than air-borne ones, but I have already given reasons for concluding that soil-borne pathogens are unlikely to provide practical weapons of war. Also, there are doubtless many pests and diseases of minor crops that do not occur wherever these crops are grown and the weather favors the pests or diseases. However, there would seem no gain from attacking minor crops; not only are countries that have gone to war very unlikely to sue for peace because they can no longer grow such things as cucumbers or pears, but it is also difficult to infect minor crops with pathogens distributed from the air, because the chances of the inoculum falling on susceptible hosts are small.

To be effective as a weapon, a pathogen must either be able to infect many different species of plants or have a major crop as its host. There are some viruses, such as aster yellows and sugar beet curly top, that seem to offer possibilities. These have wide host ranges and do not occur in every country. The obvious method of attack with these would be to drop very large numbers of infective insect vectors (leaf-hoppers) in countries where they now do not occur. The leaf-hoppers would remain infective for some weeks and, where dropped in sufficient numbers, would no doubt cause considerable damage to many different crops.

Whether the effects would be enough in one year to make the effort worthwhile, I cannot guess, and whether they would continue into other years is also problematical, and again will depend on the weather. Where the winter allows both the vectors and infected host plants to survive, and where the summer favors the multiplication of the vectors, then the results could be lasting; but where neither happens, virus and vector will soon disappear. Even where the climate favors survival, however, the vectors and disease might still be kept within bounds by insecticides, of which there are now many that deal adequately with leaf-hoppers. Similarly, introducing the Colorado beetle might in the past have had disastrous results in many countries, but now it can be readily controlled by spraying.

For attacks on major crops, a fungus such as stem rust (Puccinia graminis) of cereals, although already almost world-wide in its distribution, seems to offer the greatest possibilities. As with potato blight, however, the possibilities de-

pend on the microbial geneticist producing new forms. The damage P. graminis does varies enormously in different countries, and in many it is unimportant because the weather does not suit it. There would be no point in attacking these countries with it, but there are others, such as those in North America, where losses have largely been avoided over the last 20 years only by growing resistant varieties of cereals. There the weather obviously often favors the pathogen, and if forms could be bred that attack all current wheat varieties, releasing their spores over the prairies might lead to widespread outbreaks of rust. However, I can say only "might" and not "would," because again, even in the prairies, the weather does not always favor infection by and the spread of P. graminis, and the outcome of the operation would depend not only on the weather when the spores were released, but on the subsequent weather too.

From bitter experience of unsuccessful attempts to initiate outbreaks of specific pests and diseases in field crops where we have wished to test possible control measures, I know how difficult the task is, even when the attempt can be made at leisure and with full knowledge of the local weather. The difficulties of doing it in enemy territory would be so much greater that success could at the most only be hoped for rather than expected. If I had the task of destroying cereal crops in regions like the prairies, rather than trying to use P. graminis, even if there were a form that attacks all current wheat varieties, I should prefer to try and set fire to the crop with incendiary bombs just before harvest, (or better still the granaries after harvest) for although I should not be too confident of success with this, I should be more so than with the undependable fungus.

Similarly, if I had to attack broad-leaved (dicotyledonous) plants, I should not rely on the uncertain results of introducing plant pests and diseases, which might or might not become established, and even if they did would affect only a limited number of species. I should instead use the hormone weed-killers, such as 2,4-D (2 : 4-dichlorophenoxyacetic acid), which affect an enormous range of species and whose efficacy when sprayed from airplanes has been established thoroughly, not only by their effects on weeds, but even more so by the damage they have often done to sensitive crops contaminated only by spray drifting far from where it was meant to fall. It is true that, by killing broad-leaved weeds, they might improve the enemy's cereal and other monocotyledonous crops, but this would be a trifling benefit compared to their other consequences.

Although different broad-leaved plants differ in their sensitivity, most are affected by minute amounts of this hormone and, in addition to the great crop losses they could cause, the psychological effect on the enemy of seeing the plants over large areas curling, twisting and shrivelling could not help but be enormous. The use of hormones, too, would be free from what I think the greatest drawback to using pests and diseases as weapons of war. The effects of the hormones would be restricted to the country where they were applied, and the effect would be once and for all. Pests and diseases can do damage only when they multiply; when they multiply, they spread, and in spreading they pay no regard to national frontiers.

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The first essential, then, before deciding to use pests or microbes against an enemy, whether directed at human beings, stock or crops, is the assurance that the country using them is wholly safeguarded should the pests or microbes return, as in time they surely will.

Having admitted the practicality of damaging crops by hormones and the possibility of using pests and diseases, I nevertheless feel that to attack crops by any means would be misdirected effort in an attempt to win a war. The attack has to be over too great an area, entailing an immense effort for uncertain results. Even if we exclude nuclear weapons, the effects of attacking crowded towns with high explosive and incendiary bombs will produce much greater results. If nuclear weapons are used, they will not only destroy the towns, but also crops over great areas, and nothing that can be done in any other way could produce any comparable effects.

Charles G. Higgins (United States)
August 28, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare X.1

PROPHYLAXIS OF THE MIND

History has been a bath of blood, and whereas in earlier wars injury and death was confined to those who partici pated in armed conflict, military efforts in succeeding wars have been directed toward mass destruction of property and life.

The motivating force, the objective from the military standpoint of utilizing nuclear weapons and biological warfare, is distinctly a psychologic and destructive approach, thereby influencing the capability of a nation to continue the conflict or exerting a profound effect upon the will, the esprit de corps and the mental or emotional responses of the citizens of the country attacked.

We in the field of medicine and surgery are cognizant of the scientific contributions so generously given by allied scientists to our chosen field; i.e., by chemistry, biology, bacteriology, physics and other basic sciences.

As I have frequently stated, medicine is perhaps a unique profession. Among ethical practitioners and scientists there are no secrets, no boundaries, and contributions made to enhance medical care, to reduce the morbidity and mortality of disease, is immediately disseminated throughout the world. This is attested by the discovery of Insulin, a Canadian contribution; the Salk vacc[illegible] for poliomyelitis, an American contribution; the chemotherapeutic agent, Penicillin, a contribution from England; and many similar examples might be cited.

In visiting foreign countries, including my recent trip to the Soviet Union, I have been impressed by the cordial reception tendered physicians and surgeons by their foreign colleagues, and their desire to familiarize you with clinical and experimental studies being undertaken in their laboratories. In what other field of endeavor, at least at the present time, are available missionaries of good will and exponents of the brotherhood of man, whose lives are dedicated to the preservation rather than the destruction of human life?

Scientific achievements can be utilized for constructive or destructive purposes; i.e., to eradicate disease, allay pain and suffering, or to promote death. At times they may be employed for both purposes. This is exemplified by the work in progress at Oak Ridge. On the one hand, radio-isotopes are made available to the medical profession for the treatment of malignant disease, whereon the other hand thermonuclear agents with a capacity for destruction beyond comprehension of the human mind are made available to our military establishments. Such thermonuclear agents not only being effective in mass destruction of human life and property, but through the fall-out activities, influencing deleteriously the future of mankind.

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While thermonuclear warfare with its catastrophic consequences may remain a local activity, influenced by the size of the destructive agent, its effect on future generations poses a problem of no little importance to the scientists, who by their contributions may convince militarists of its inherent danger as a weapon when offered to the God of War, for as Lord Bertrand Russell states, "The conscience of scientists cannot condone the misapplication of great technical advances."

Biologic warfare poses additional consideration to the physician, who devotes his life to the cure and eradication of disease caused by infectious pathogenic agents. The Hippocratic oath signifies the obligation of the physician to heal and comfort the ill, and the conscience of physicians finds it difficult to condone destruction of life by pathogenic agents that might be used in biologic warfare. Thermonuclear-chemical and biologic weapons may attain such destructive capacity, and exert such a profound effect on future generations, as to render man obsolete.

Is there another approach to the problem? In this era of so-called advanced civilization, is it not possible to settle world problems without recourse to military aggression.

The role of balance of power in prevention of war is not applicable in our generation in the presence of such instrumentalities of destruction, and the smaller countries may now produce such weapons due to the low cost of production and relative comparative ease of production.

A peaceful approach to the solution of world problems was initiated by the formation of the League of Nations at Geneva, Switzerland, in 1920. The ineffectiveness of this organization was evident by Germany's severing relations with the League and withdrawing from the disarmament conference in 1933. In 1935 Ethiopia appealed to the League of Nations for action against Italy. Economic sanctions against Italy became effective in 1935, supported by 52 nation members and one non-member (Egypt). The sanctions ended July, 1936.

The failure of this initial attempt to solve world controversies without recourse to war might have been predicted. A mechanism to assure durable peace requires world acceptance of policies contrary to previously accepted principles.

The second approach, the one in effect at the present time; i.e., United Nations first General Assembly, opened in London in 1946, stating in its Charter the determination to save succeeding generations from the scourge of war, which twice in our lifetime has brought untold sorrow to mankind, and to unite its strength to maintain international peace and security. This organization is a potent factor in molding public opinion. To succeed it is essential that there be the will and desire to settle disputes and controversies amicably. It has been stated

that clarity of thought and the capacity for rapid, clear thinking will assume vastly more importance in the future, in the turbulent times of a progressive accelerating pace of social and economic change. The period of time essential for economic and social adaptation will be steadily shortened. The role of wisdom to counteract forces instrumental in jeopardizing freedom will assume more importance.

Nations must be deprived of the power of mass destruction, national security assured to nations large and small, and a world judicial body demanding respect and confidence of nations established to work in harmony with a world legislative and a world executive organization, and finally means to enforce their decisions provided. Is it possible? Yes, with difficulty - impossible, no. Elimination and abolition of war - world peace - is the solution, and only solution, available for elimination of thermonuclear and biologic weapons employed in the destruction of mankind.

Evidence clearly indicates that if our problems cannot be solved without recourse to thermonuclear, chemical and biologic warfare, modern man will destroy himself, for instruments of destruction are being discovered of such magnitude as to be uncontrollable even to the nation employing them. To employ such means of destruction would subject the aggressor nation to international criticism, yes, hate and scorn, not only by the present generation, but in the future.

In conclusion, several questions arise deserving serious consideration:

1. In this world in which 50 per cent of the population have inadequate food, shelter and clothing, should world governments appropriate over 100 billion dollars yearly for military defense or for instruments of aggression? Additional aid for the people of impoverished countries would bear grateful results.

2. Should not governmental budgets include large appropriations devoted to research in humanities, studies of human behavior - why man acts as he does, not how - and ascertain and study the socio-economic problems?

3. Can we not thereby determine why the peoples of the earth cannot coexist in peace and harmony, eliminating suspicion, greed, hate and other factors instrumental in maintaining the world in a state of turmoil?

4. Should we not encourage further exchange of educators, scientists and students from the various countries of the world?

5. In this era of so-called advanced civilization and culture, cannot many of the controversial issues be resolved at the conference table? This obviously requires the will and desire on the part of the negotiators to resolve their differences harmoniously and amicably.

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6. Have the evolutionary processes involving eons of time developed a cerebral cortex that does not have the intellectual capacity adequately to cope with world problems by a constructive approach to, rather than a destrutive solution of, world problems?

In an enduring-progressive society, scientific achievements and contributions must continue to evolve, but for the benefit and advancement of mankind, they should be channeled through paths frequently blocked, it is true, for the elevation of standards of living, and the welfare of mankind, regardless of race, creed or color.

Man is at the cross roads: not only are present world inhabitants involved, but the destiny of future generations is at stake. I believe the scientists of the world may play an important role in leading mankind down the winding road to peace, happiness and prosperity.

Professor H. Bentley Glass (United States)
August 28, 1959
Pugwash Conference of International Scientists
on Biological and Chemical Warfare

PROBLEMS OF INTERNATIONAL CONTROL OF CHEMICAL AND BIOLOGICAL WEAPONS

I. At first sight, it may appear difficult to say anything more on this matter beyond the obvious fact that, however difficult the international control of atomic weapons may be, the international control of bacteriological and chemical weapons seems incomparably more difficult. It is easy to list a considerable number of reasons why this should be so.

1. The specific agents, or combinations of agents, which might be selected for use in chemical and biological warfare cannot be foreseen, but lurk among many potential agents.

   a. The most effective nerve gases and hallucinatory chemicals are closely related to widely manufactured and extensively used insecticidal and pharmaceutical agents. Minor chemical changes may convert a relatively harmless substance into a lethal or incapacitating agent of great potency.

   b. The most likely bacterial, viral, and fungal agents are among numerous infectious organisms that are widely cultivated in microbiological laboratories in the study of disease. Moreover, genetic mutations which may occur spontaneously at any time or may be induced and selected out, may convert a relatively harmless organism into one of high virulence.

2. The selection and preparation of chemical or biological agents of warfare requires no elaborate or large-scale facilities. The ordinary chemical or microbiological laboratory might be such a center, or a unit in a dispersed program. The identification of such centers of preparation for biological or chemical warfare would therefore be extraordinarily difficult. Even in the event of mass production of such agents, the installations are so like those widely used in vaccine or antibiotic production that identification might be very difficult.

   a. It follows that small nations as well as large and wealthy ones, industrially undeveloped nations as well as highly industrialized ones, might prepare in complete secrecy for the use of such weapons.

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b. It also follows that in this area we must already face the "nth power" problem. Acts of anonymous attack or sabotage by means of biological agents may lead to local outbreaks of hostilities; or may be so attributed as to lead to a holocaust.

3. The means of dispersal of chemical and biological agents of warfare are not unique. They are adapted to dispersal from planes and from submarines from conventional and rocket missiles as well as by saboteurs. There would therefore be no specific means of controlling the dispersal phase except by means of a general ban upon modern forms of armaments.

4. Protection of an aggressor's own population against its own chemical and biological agents would not be distinguishable from purely defensive measures against anticipated attacks by other nations or from immunizations carried out purely for reasons of public health.

II. If control by inspection is virtually impossible, is there no alternative way of minimizing the danger of the use of chemical and biological weapons?

It seems clear that international renunciation of the use of such weapons, as in the 1925 Geneva Protocol, cannot be effective unless all nations, small as well as large, ratify such an agreement. Otherwise, under the guise of solely defensive measures, offensive preparations may be conducted on a considerable scale.

It further seems clear that secrecy is of the essence in such preparations. The danger rapidly diminishes as general knowledge of the nature of potential chemical and biological agents becomes increased.

The most hopeful approach to international regulation of this area therefore seems to comprise (a) a general agreement to renounce the use of such weapons, and (b) the renunciation of secrecy and of security controls over all microbiological, toxicological, pharmaceutical, and chemical research.

In considering means of implementation of the second of the foregoing proposals, one may point to the already excellent effects of the Report of the U.N. Scientific Committee on the Biological Effects of Radiation. A comparable committee, or a permanent U. N. Commission, on biological and chemical modes of warfare, could serve to dispel much of the atmosphere of dread and secrecy that now surrounds this phase of military activity. The very existence of such a United Nations organ might in time generate what I believe to be the only ultimately effective safeguard against violations, namely, the conscience of the individual scientists of all nations which would lead them to protest every instance of restriction of the free publication of microbiological, toxicological, pharmacological, and chemical research and would report each such restriction to the United Nations.

In the end, only the absolute prevention of war will preserve human life and civilization in the face of these as well as nuclear weapons. No ban of a single type of weapon, no agreement that leaves the general threat of war in existence, can protect mankind sufficiently. We therefore must look forward to a day when national aims will be generally recognized as secondary to international peace, and when the United Nations will have power actually to preserve the peace.

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Fields of Specialty of Participants in Pugwash Conference of International Scientists on Biological and Chemical Warfare

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Professor Donald Kerr
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Dr. Pierre Thibault
Bacteriology
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Alphabetical List of Communications

M. L. Ahuja
The Potentialities of Smallpox as a Biological Warfare Agent Against Man — V. 4

F. C. Bawden
Plant Diseases — IX. 1

Lord Beaverbrook
Cablegram — VII. 2

Claude E. Dolman
Historical Comments on the Potentialities of Bacteria and Their Toxins — IV. 2
Questions Relating to the Potentialities of Bacteria and Their Toxins — IV. 3

M. M. Dubinin
Address at Opening of Conference — II. 0
Potentialities of Chemical Weapons — III. 1

Cyrus Eaton
Comments on Cablegram from Premier Nikita Khrushchev — III. 0
Welcoming Address — 0. 2

Sven Gard
Potentialities of Enteric Viruses — V. 3

H. Bentley Glass
Problems of International Control of Chemical and Biological Weapons — X. 2

Charles C. Higgins
Prophylaxis of the Mind — X. 1

Alexandre A. Imshenetsky
Modern Microbiology and the Biological Warfare Menace — VI. 2

Martin M. Kaplan
Some Epidemiological Considerations of Communicable Diseases of Man and Animals in Biological Warfare — II. 1

Donald Kerr
Meteorology and the Problems of Delivery (with Freben von Magnus, Gordon Manley and Robert Watson-Watt) — VII. 1

Premier Nikita Khrushchev
Cablegram — III. 0

Chauncey D. Leake
Consideration of "Nerve Gases" as Chemical Warfare Agents — III. 2

André Lwoff
Theoretical Possibility of Selecting Infectious Disease Agents for Biological Warfare — IV. 4

Freben von Magnus
Potentialities of Respiratory Viruses — V. 2
Meteorology and the Problems of Delivery (with Donald Kerr, Gordon Manley, and Robert Watson-Watt) — VII. 1

Gordon Manley
Meteorology and the Problems of Delivery (with Donald Kerr, Freben von Magnus, and Robert Watson-Watt) — VII. 1

Margaret Mead
Cablegram — V. 6

Theodor Rosebury
Biological Warfare: Some Historical Considerations — I. 1

J. Rotblat
The Pugwash Movement — 0. 3

The Earl Russell
Opening Address — 0. 1

A. A. Smorodintsev
Microbiology and Bacteriological Warfare — V. 1
The Potentialities of Arthropod-Borne Viruses as a Biological Warfare Agent Against Man — V. 5

Prime Minister Robert Stanfield
Telegram — 0. 5

M. G. P. Stoker
The Potentialities of the Rickettsiae in Biological Warfare — VI. 1

F. Thibault
Potentialities of Bacteria and Their Toxins — IV. 1

Robert Watson-Watt
The Dangers of Official Secrecy — I. 2
Meteorology and the Problems of Delivery (with Donald Kerr, Freben von Magnus, and Gordon Manley) — VII. 1

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